

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT		1. CONTRACT ID CODE		PAGE PAGE 1	OF 3
2. AMENDMENT/MODIFICATION NO. AM-0006		3. EFFECTIVE DATE 02/19/02		4. REQUISITION/PURCHASE REQ. NO.	
5. PROJECT NO. (If applicable)		6. ISSUED BY CODE		7. ADMINISTERED BY (If other than Item 6) CODE	
US ARMY ENGINEER DISTRICT, HONOLULU CORPS OF ENGINEERS, BUILDING S-200 FORT SHAFTER, HAWAII 96858-5440 CONTRACT SPECIALIST: RENEE M. HICKS					

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)		(X)	9A. AMENDMENT OF SOLICITATION NO.
		X	DACA83-02-R-0003
			9B. DATED (SEE ITEM 11) 12/07/01
			10A. MODIFICATION OF CONTRACT/ORDER NO.
			10B. DATED (SEE ITEM 13)
CODE	FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. Accounting and Appropriation Data (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc). SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
FY02 MCA PN 50846 COLD STORAGE FACILITY, AND FY01 RDT&E REPAIR WATER TANKS, U.S. ARMY KWAJALEIN ATOLL

(See Page 2 of 2 Pages)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF SIGNER (Type or print)	
15B. CONTRACTOR/OFFEROR		16B. UNITED STATES OF AMERICA	
(Signature of person authorized to sign)		BY (Signature of Contracting Officer)	
15C. DATE SIGNED		16C. DATE SIGNED	

1. CHANGES TO SPECIFICATIONS. Attached hereto are revised pages and sections to the specifications. The revision mark "(AM-0006)" is shown on each page. Changes are indicated in **bold**.

Section 00010 - PROPOSAL SCHEDULE
Section 00100 - TOC, 52.217-5 "Evaluation of Options (JUL 1990)"
Section 00800 - TOC, S-17.1 "Option for Increased Scope-Separately
Priced Line Item (APR 1996), APPENDICES A and B
Section 00900 - Questions and Answers

COLD STORAGE

Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE
- paragraphs: 1.6.2.1

Section 08700 BUILDERS' HARDWARE
- paragraphs: 3.2

WATER TANKS

Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE
- paragraphs: 1.7.4 and 2.3.2

2. CHANGES TO DRAWINGS

REVISED DRAWINGS (ISSUED: 02/08/02). The following are revised drawings replace like-number drawings and are issued herewith:

<u>RING NO.</u>	<u>DRAWING NO.</u>	<u>SHEET NO.</u>	<u>LETTER</u>	<u>TITLE</u>
2	432-10-01	T-2	b	SCHEDULE OF DRAWINGS
5	432-10-01	C-2	b	DEMOLITION PLAN
26	432-10-01	A-9	b	WALL SECTIONS
27	432-10-01	A-10	b	WALL SECTIONS
28	432-10-01	A-11	b	WALL TYPES
29	432-10-01	A-12	b	MISCELLANEOUS ROOF DETAILS
42	432-10-01	S-1	b	REVISED GENERAL NOTES
79	432-10-01	M-19	b	MECHANICAL EQUIPMENT SCHEDULES
83	432-10-01	E-1	b	ELECTRICAL SITE PLAN AND ELECTRICAL SYMBOLS

AM-0006
RFP No. DACA83-02-R-0003
Item 14 (Continued)

Standard Form 30
Page 3 of 3 Pages

<u>RING NO.</u>	<u>DRAWING NO.</u>	<u>SHEET NO.</u>	<u>LETTER</u>	<u>TITLE</u>
85	432-10-01	E-3	b	LIGHTING PLAN
86	432-10-01	E-4	b	MECHANICAL AND ELECTRICAL ROOM PLAN
87	432-10-01	E-5	b	OFFICE MGR. LOCKER AND JAN ELECTRICAL PLAN
88	432-10-01	E-6	b	SINGLE-LINE DIAGRAM
89	432-10-01	E-7	b	REFER./FREEZER CONTAINER RECEPTACLE CONNECTION DIAGRAM
92	432-10-01	E-10	b	UNIT SUBSTATION ELEVATION AND DETAIL, AND MISCELLANEOUS DETAILS
96	432-10-01	E-14	b	PANEL SCHEDULE
98	432-10-01	E-16	b	PANEL SCHEDULE
99	432-10-01	E-17	b	PANEL SCHEDULE
101	432-10-01	E-19	b	RISER DIAGRAMS
102	432-10-01	D-1	b	REFERENCE AS-BUILT DRAWING - BLDG 610-612-701
103	432-10-01	D-2	b	REFERENCE AS-BUILT DRAWING - BLDG 610
104	432-10-01	D-3	b	REFERENCE AS-BUILT DRAWING - BLDG 612
105	432-10-01	D-4	b	REFERENCE AS-BUILT DRAWING - BLDG 701
106	432-10-01	D-5	b	REFERENCE AS-BUILT DRAWING - BLDG 701

2. The proposal due date of March 1, 2002, 2:00 P.M. Hawaiian Standard Time (HST) remains unchanged.

Request for Proposals No. DACA83-02-R-0003

SECTION 00010
PROPOSAL SCHEDULE

FY02 MCA Cold Storage Facility and
RDT&E Repair Water Tanks
Kwajalein Atoll, Marshall Island

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	AMOUNT
1.	Construct Cold Storage Facility (Includes\$_____ for Mobilization	1	Job	\$_____
		and Demobilization)		
2.	Repair Water Tanks 946 and 947 (Includes\$_____ for Mobilization	1	Job	\$_____
		and Demobilization)		
TOTAL BASE SCHEDULE				\$_____

OPTION

3.	Repair Water Tank 966 (Includes\$_____ for Mobilization	1	Job	\$_____
		and Demobilization)		
TOTAL BASE SCHEDULE PLUS GOVERNMENT OPTIONS				\$_____

THE FOLLOWING WILL BE COMPLETED BY THE CONTRACTING OFFICER UPON AWARD:

TOTAL AWARD AMOUNT (Base Schedule plus Government Option) \$_____

NOTES TO PROPOSAL SCHEDULE:

1. Failure to bid on all the items in the Proposal Schedule may cause the bid to be considered nonresponsive.

2. By submission of an offer under the GOVERNMENT OPTION, Bidder agrees that the Government may exercise the GOVERNMENT OPTION at the time of the award, or at any time within 90 days following the date of the award of the basic contract. (See Provision No. 52.217-5, EVALUATIONS OF OPTIONS, in Section 00100).

PAYMENT (S)

Compensation for all work to be performed under this contract will be made under the payment item(s) listed herein. The principal features of the Work to be included under the payment item(s) are noted. Work required by the drawings and specifications and not particularly mentioned shall be included in and be paid for under the contract price for the item to which the work pertains. Price(s) and payment(s) for the item(s) shall cover all work, complete and finished in accordance with the specifications, schedules, and drawings, and shall be full compensation for all work in connection therewith, including quality control and cost of performance-and payment-bond premiums as specified in the CONTRACT CLAUSES. Price(s) and payment(s) shall constitute full and final compensation for furnishing all materials, equipment, management, supervision, labor, transportation, fuel, power, water, and all incidental items necessary to complete the work, except as otherwise specified to be furnished by the Government. For the purpose of CONTRACT CLAUSE entitled "PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS", the term "designated billing office" and "designated payment office" are as follows:

a. Billing Office
U.S. Army Corps of Engineers
Kwajalein Resident Office
PO Box 28
APO AP 96555-2528

b. Payment Office .
Central Accounting Office
PO Box 17073
Honolulu, HI 96817

Item numbers mentioned herein after correspond to the item numbers in the PROPOSAL SCHEDULE.

a. Item No. 1, Construct Cold Storage Facility, will be paid for at the contract price, complete in place and ready for use, including site preparation, building, water lines, sanitary-sewer system, storm-drainage system, stone protection work, pavement, concrete sidewalks, curbs, and gutters, security fencing, established of turf, mechanical work, electrical work, installation of Government-furnished property, testing, final connections, cleanup, and all incidental items necessary to complete the work.

b. Item No. 2, Repair Water Tanks **946 and 947**, will be paid for at the contract price, complete in place and ready for use, including site preparation, testing, final connections, cleanup, and all incidental items necessary to complete the work.

c. Item No. 3, Repair Water Tank **966**, will be paid for at the contract price, complete in place and ready for use, including site preparation, testing, final connections, cleanup, and all incidental items necessary to complete the work.

- End of Section -

TABLE OF CONTENTS
SECTION 00100

52.204-6	DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (JUN 1999)
52.211-2	AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS & DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (DEC 1999)
52.211-14	NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)
52.215-1	INSTRUCTIONS TO OFFERORS - COMPETITIVE ACQUISITION (MAY 2001)
52.215-20 IV	REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA (OCT 1997) ALT IV (OCT 1997)
52.216-1	TYPE OF CONTRACT (APR 1984)
52.225-12	NOTICE OF BUY AMERICAN ACT/BALANCE OF PAYMENTS PROGRAM REQUIREMENT - CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT (FEB 2000)
52.233-2	SERVICE OF PROTEST (AUG 1996)
52.236-27 I	SITE VISIT (CONSTRUCTION) (FEB 1995) -- ALTERNATE I (FEB 1995)
52.236-28	PREPARATION OF PROPOSALS - CONSTRUCTION (OCT 1997)
S-36.4	PRE-PROPOSAL CONFERENCE (JUL 1995)
S-36.2	MAGNITUDE OF THE PROPOSED PROJECT
S-28-3	PENAL SUM AND FORM OF OFFER GUARANTEE
K-2	RESTRICTIONS ON AWARD
* 52.217-5	EVALUATION OF OPTIONS (JUL 1990) *

(AM-0006)

(5) That firm must employ citizens of the United States or the Republic of the Marshall Islands in more than half of its permanent, full-time positions in the United States and/or in the Marshall Islands.

(e) For a joint venture to qualify as a United States or Marshall Island contractor, each member of the joint venture must meet all the requirements set out in (c) or (d) above, as appropriate.

(f) In addition, to qualify for award of a contract under this solicitation, a firm or person must have proven, as indicated by prior contracting experience in the United States and/or in the Marshall Islands, that it possesses the technical, managerial, and financial capability to successfully complete a project similar in nature and technical complexity to that described in this solicitation; and it must presently possess the technical, managerial and financial resources in the United States and/or in the Marshall Islands to perform the contract.

(g) Nothing in this provision shall be construed to prohibit award to a joint venture between United States and Marshall Islands contractors, so long as each member of the joint venture meets the criteria otherwise required by this provision.

[End of Statement]

*52.217-5 EVALUATION OF OPTIONS (JUL 1990)

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

(End of Provision)

*

(AM-0006)

*S-17.1 OPTION FOR INCREASED SCOPE--SEPARATELY PRICED LINE ITEM (APR 1996) *

A.1 - UTILITY OUTAGE COORDINATION RECORD

A.2 - SUMMARIZATION OF AIRBORNE ASBESTOS SAMPLING RESULTS

A.3 - PROJECT SIGNS

A.4 - LIST OF DRAWINGS

APPENDIX B - FINANCIAL POLICY AND RATE MANUAL --

APPENDIX C - AGREEMENT REGARDING THE MILITARY USE AND OPERATION RIGHTS

APPENDIX D - STATUS OF FORCES AGREEMENT

APPENDIX E - AGREEMENT BETWEEN THE GOVERNMENT OF THE UNITED STATES AND
THE GOVERNMENT OF THE FEDERATED STATES OF MICRONESIA
REGARDING IMPLEMENTATION OF THE COMPACT OF FREE
ASSOCIATION

(AM-0006)

(a) Arrangements may be made through the Contracting Officer or his authorized representative for the installation of a limited number of telephones at desired locations on Kwajalein. There will be an installation charge and monthly service charge for each telephone instrument, based on prevailing rates, and the Contractor shall make payment for such services in a manner as determined and approved by the Contracting Officer.

(b) Approved communication facilities for safety purposes will be provided by the Contractor with work parties at isolated locations.

[End of Statement]

*

*S-17.1 OPTION FOR INCREASED SCOPE -- SEPARATELY PRICED LINE ITEM (APR 1996)

The Government may require the construction of the numbered line item(s), identified in the bidding schedule as (an) option item(s), in the quantity and at the price stated. The Contracting Officer may exercise the option(s) at time of award or by written notice to the @@Insert number of days from award

Contractor within **7599 days from time of award. Performance period(s) for the option(s) will be identified in the FAR clause entitled COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK, in Section 00800.

[End of Statement]

*

(AM-0006)

RESPONSES TO QUESTIONS
SUBMITTED BY VARIOUS PLANHOLDERS
FOR
RFP DACA83-02-R-0003

NOTES:

A. QUESTIONS ARE NOT LISTED IN ANY SPECIFIC ORDER. THE PLANHOLDERS WHO SUBMITTED THE QUESTIONS ARE INDICATED.

B. QUESTIONS RECEIVED MAY OR MAY NOT RECEIVE RESPONSES PRIOR TO THE PROPOSAL DUE DATE. THEREFORE, OFFERORS SHOULD DEVELOP THEIR PROPOSALS AS THEY INTERPRET THE SITUATION DESCRIBED IN THE DOCUMENTS AVAILABLE.

J.A. JONES CONSTRUCTION QUESTIONS:

1. Drawing S-4, Tank Structural Notes under item C., note # 5 states that the Contractor shall include costs for monitoring cultural resources. Please clarify this statement regarding the inclusion of cost and advise if any particular requirements are different under this contract from the previous customary practices in Kwajalein. ***RESPONSE: This drawing note has been deleted by amendment. Refer to contract specifications regarding cultural resources.***

2. Note # 6 under the same drawing noted in 1. above states Contractor is to include costs for asbestos coated underground pipe. Can the Government provide an approximate quantity of hazardous pipe expected underground?
RESPONSE: This drawing note has been revised by amendment. No asbestos-containing materials are anticipated for the underground pipe.

3. Drawing S-1 indicates that only 6 panels can be removed from the existing tank covers for access to execute construction work. If the Contractor can obtain approval from TEMCOR, would it be acceptable to remove more than 6 panels for improved access purposes?
RESPONSE: Yes, more panels can be removed, if approved by tank dome cover manufacturer, TEMCOR.

4. Drawing S-4, item H for tank testing requires the following. Fill the tank to complete capacity and monitor water level drop until ½ inch develops or three days elapse, whichever occurs first. This note and related testing criteria further states that adjustments will be made for evaporation and temperature during testing. What will the evaporation and temperature formula basis be to measure against the tank water loss? The climate varies little in Kwajalein. What is the allowable evaporation loss if calculated today?
RESPONSE: Refer to ACI 350 1.R (to be added as a reference by amendment).

5. Drawing S-7 (As Built) and Plans Sections. Details and Notes contain the following information, which is confusing and conflicting with the other documents. This drawing shows a "SCHEDULE OF WORK" and TYP PLAN FOR TANKS. In this table, 15 tanks

are listed with conflicting information. For example, it states that all tanks are to get a new FML floor system. We believe this drawing has many other notes and requirements which do not apply. Please advise what portions of Drawing S-7 and other "As Built" Drawings are applicable for this RFP.

RESPONSE: Sheets S-5 through S-9 are reference asbuilt drawings, and are provided in the contract for general reference (informational) purposes only. These are provided to assist the contractor with planning demolition and new work. New contract actual physical work requirements are not shown on the reference asbuilt drawings but are indicated on Sheets S-1 through S-4.

6. Drawing S4, note F -3 states that the Contractor will assume 150 gallons of epoxy for 500 lf of shrinkage cracks per tank for 500 lf of cracks. A similar note exists under item 4. for the floor slab, i.e., 500 gallons of epoxy for 3480 lf of shrinkage cracks. Will the contract be modified if the quantities vary? If so, what will be the basis of measurement and payment?

RESPONSE: These notes regarding quantities of epoxy will be deleted by amendment. Contract requires extraordinary procedures to eliminate concrete shrinkage cracks. Any shrinkage cracks that develop after the new concrete floor slab has been cured will be considered the responsibility of the contractor to repair by epoxy injection. The contractor will be required to determine the amount of epoxy required to repair shrinkage cracks. Existing walls are not expected to have shrinkage cracks that cause water leaks.

7. Section 03300, 1.7.3 mentions that Air Entrainment shall be required. Section 03300, 2.3.1 mentions that Air-Entrainment Admixture shall not be used. Section 03300, 3.14.4 and 3.14.5 mention the use of Air-Entrainment agents or admixture. Please indicate which spec is the required.

RESPONSE: The following paragraph is being added to Section 03300: "1.8.3 Air Entrainment. All normal weight concrete shall be air entrained to contain between 4 and 7 percent total air, except that when the nominal maximum size coarse aggregate is 3/4 inch or smaller it shall be between 3.5 and 5.5 percent. Concrete with specified strength over 5000 psi may have 1.0 percent less air than specified above. Specified air content for normal weight concrete shall be determined in accordance with ASTM C 231." Also, the following will replace the text in Contract Specification 3300, paragraph 2.3.1, Air Entrainment Admixture: "ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions."

8. It is our understanding that there are no items required for handover as Government salvage at the existing Cold Storage Warehouse. Is our understanding correct?

RESPONSE: Correct.

9. Detail 1 of Drawing A-9 indicates a double layer of 6 mil Polyethylene sheets with tapped or folded staggered joints under the 89 mm thick cement grout layer with the radiant tubing of the Freezer Slab system. On the other hand, the typical slab details shown on Drawing S-2 do not show these sheets. Only a 15 mil Polyolefin Geomembrane is shown as a vapor barrier for the Office, Mechanical and Electrical Rooms. Spec

Section 07225 – REFRIGERATED FLOOR INSULATION, Paragraph 3.2.1 indicates to provide Vapor Barrier (Black polyvinyl chloride, 0.75 mm thick) and Slip Sheet beneath the entire concrete floor slab and floor insulation as indicated. Please clarify if the Polyethylene sheets are to be installed according to Drawing A-9 or beneath the insulation as indicated in Section 07225. Please send a detail for a better understanding.

RESPONSE: For Office, Mechanical & Electrical Rooms: Follow note “15 mil polyolefin geomembrane” on structural sheet S-2 for vapor barrier requirements. For vapor barrier & slip sheet requirements for freezer, chill, ice storage, receiving/issue, freezer staging rooms, see Amendment #6.

10. Section 03300, 1.6.2.1 - Strength Requirements - indicates a compressive strength of 27.5 Mpa for the Concrete Topping over Refrigeration and Freezer Floors. Section 03300, 1.7.3 – Mix Design for Topping for Refrigeration and Freezer Floors asks for a 28-day strength of at least 34.5 Mpa. Please define which strength is correct.

RESPONSE: Refrigerator and Freezer floors shall have a minimum compressive strength of 34.5 Mpa. Section 03300, 1.6.4, regarding slump increase, please refer to slump table in specs which allow the maximum slumps as shown.

11. Section 02754, 2.2.1. Can Round Concrete Aggregate be used in the pavement construction?

RESPONSE: Round concrete aggregate should not be used for the pavement. The use of round aggregates will decrease the strength and bonding of the concrete pavement. The overall integrity of the pavement section may be difficult to control.

12. On sheet M-18 the schedule of unit coolers served by rack "A" is a total 92 tons of refrigeration and for rack "B" a total 50 tons. Then on sheet M-19 the schedule of compressor racks calls out rack A at 50 ton and rack B at 92 ton. Please clarify which is correct and verify the compressor sizing called out in the rack schedule.

RESPONSE: The Mechanical Equipment Schedule and Electrical drawings were revised to resolve this.

DICK-PACIFIC CONSTRUCTION QUESTIONS:

13. Please clarify if subcontracting plan require to submit as part of bid submittal, if yes, please provide us the requirements and standard forms.

RESPONSE: No, the small business requirements (i.e., subcontracting plans) does not apply to this project.

14. Please clarify if the general contractor require to provide full time QC manager and Safety officer for the duration of the project, if yes, what are the qualification.

RESPONSE: CQC requirements have been added by amendment. Safety Officer must have at least 5 years of safety experience and be first-aid and CPR certified.

15. On page 00800-24, K-21: Will the government to handle the UXO ordinance survey and clearance prior to contractor site clearing and grading?

RESPONSE: Yes.

16. On page 00700-64, 52.236 Permits Responsibility: Please clarify if general contractor require to secure building permit and pay all fees to government of Marshall Island?

RESPONSE: Only the Marshalllese income tax is required.

17. Please extend the deadline of submission of question for another 4-weeks.

RESPONSE: As stated at the pre-proposal conference, questions will continue to be accepted; however, there is no assurance that responses will be provided in sufficient time to allow appropriate adjustment of proposals.

18. Existing buildings to be demolished: Is there a landfill area that we can use to dump materials or do all materials have to be removed from island.

RESPONSE: The existing landfill will be available for appropriate materials.

19. Asbestos: Can you please tell us what type and thickness of existing materials. Do these materials have to be removed from Island or again is there a landfill area that we can use.

RESPONSE: See hazardous materials survey report. The asbestos must be removed from the island.

20. Please provide specifications for the new FML waterproofing system

RESPONSE: New FML waterproofing system is not required for the project. Detail 3/S-1/S-1 requires existing FML liner tank liner to be removed. Reference asbuilt drawing sheet S-6 shows the existing asbuilt condition of the FML tank liner.

21. Will submitted bids for the water tanks be awarded at the same time with the cold storage facility or at a different date?

RESPONSE: It is currently intended to award both projects at the same time, if funds are available.

22. Please provide drawings for the three existing buildings to be demolished. (Floor plans, elevations, cross sections, and general mechanical, electrical layout plans)

RESPONSE: Drawings and notes will be provided by amendment.

23. Price breakdowns – Parts 1, 2, & 3, Parts 2 & 3 are the same and have no reference to solicitation numbers. Is Part 2 for the cold storage facility and Part 3 for the water tanks?

RESPONSE: The format for the submission of Cost Breakdown was revised and issued with Amendment 0005.

24. Drawing S-1 dome cover notes No. 3. Removal and replacement of dome tank cover by TEMCOR or by others: Please clarify who is responsible to the removal & replacement COST to be rendered by Temcor, the government or general contractor.

RESPONSE: Note 3 reads in part as follows: "Removal and replacement of the tank cover panels for construction purposes shall be performed by the original tank cover

manufacturer or if by others, shall be in accordance with and approved by the original tank cover manufacturer (TEMCOR)." The general contractor is responsible for cost to remove tank dome cover for construction purposes. The general contractor may perform this work himself, subcontract this work to TEMCOR or another subcontractor of his choice, however, removal of the tank dome cover must be performed in accordance with the original tank dome cover manufacturer procedures.

25. Please confirm if water tanks # 966, 946 and 947 are the only three (3) tanks to be repaired under this contract.

RESPONSE: Concur, only tanks 966, 946 and 947 are to be repaired under this contract.

26. Drawing S-7 As-built Drawing, Schedule of works: Again, please re-clarify only tank #966, 946 & 947 are the tanks to be repaired, the other twelve (12) tanks that listed on the schedule are NOT part of the scope of work.

RESPONSE: To re-clarify, only tanks 966, 946 and 947 are to be repaired under this contract. There seems to be some confusion of what is required by drawing sheet S-7. Please note that drawing sheets S-5 through S-9 are reference asbuilt drawings and only show existing asbuilt conditions. The reference asbuilt drawings are provided in the contract for general reference (informational) purposes only and are provided to assist the contractor with planning demolition and new work. New contract actual physical work requirements are not shown on the reference asbuilt drawings S-5 through S-9. Actual new work for tanks are indicated on Sheets S-1 through S-4.

27. Drawing detail 2/S-1, what is the size/area of roof dome opening for construction access. Is the area of opening accessible to bring-in backhoe w/ breaker?

RESPONSE: Actual construction access dimensions should be coordinated with the original tank dome cover manufacturer, TEMCOR representative, (Mike Weitzenhoff, M & M tank, 808 845 7556).

28. Please clarify if the water tank need to install new FML liner system after removal of existing, if yes please provide materials specification.

RESPONSE: New FML waterproofing system is not required for the project. Detail 3/S-1/S-1 requires existing FML liner tank liner to be removed. Reference asbuilt drawing sheet S-6 shows the existing asbuilt condition of the FML tank liner.

29. Please clarify all information shown in "AS BUILT/ FOR REFERENCE ONLY" are not part of the scope of work under this contract.

RESPONSE: Drawing sheets S-5 through S-9 are reference asbuilt drawings and only show existing asbuilt conditions. The reference asbuilt drawings are provided in the contract for general reference (informational) purposes only and are provided to assist the contractor with planning demolition and new work. New contract actual physical work requirements are not shown on the reference asbuilt drawings S-5 through S-9. Actual new work for tanks are indicated on Sheets S-1 through S-4.

30. Drawing S-4, Note "I" Water Tank Disinfections: Please clarify where to dispose or drain approximately 18,000 Gallons of water during disinfection.

RESPONSE: *An amendment will be made to require disinfection by spraying with 500 ppm chlorine solution. After tank is sprayed with the disinfection solution, the tank would be filled with water to dilute the solution to 10 ppm concentration and then the solution would be used for potable water.*

31. Drawing S-1, Plastic Liner Removal Notes, Item 2. The liner shall be removed by method approved by the government to minimize damage to existing liners: Please provide information what is the acceptable removal method of the government.

RESPONSE: *Tank liner is loosely laid on tank floor, draped on the tank walls and held in place with embedded wall anchor bolts. Refer to reference asbuilt drawings sheet S-6. Method to remove tank liner work should be provided to the contracting officer representative for approval once project has been awarded.*

32. On drawing sheet C-3 Legend, indicated the 508mm and 205mm new un-reinforce concrete pavement, however on drawing sheet C-8 detail 20 & 21 indicated with reinforced concrete pavement. Please clarify which to follow.

RESPONSE: *Reinforced detail to be used for odd-shaped slabs ($L > 1.25W$) and mismatched joints.*

BLACK CONSTRUCTION QUESTIONS:

33. Light Fixture Type 'D' - Luminaire Details on Dwg. E-18 shows a surface mounted fixture (WideLite - FreezerLyte Model), which requires wiring and raceway below the insulated ceiling panel while mounting Det 5/E-3/E-10 shows pendant mounted (Widelite WarehouseLyte Model) with wiring and raceways above the insulated panels. Please clarify correct fixture model or mounting scheme.

RESPONSE: *The Type D Fixtures are installed inside of the refrigerated compartments, and must be supported independent of the freezer panels. The wiring between light fixtures should be run outside of the refrigerated box, and should not be attached to the freezer panels. Widelite WL Series (FreezerLyte) is correctly specified for light located inside refrigerated compartment. WideLite's "WarehouseLyte" series is not suitable for this application, and should not be used.*

34. Refrigerated Container Receptacles - Det 4/E-1/E-10 shows T&B MIPCO #333FC. Current T&B Catalogs show this item as obsolete. Suggested replacement is AMERACE #333FCV. Please check if acceptable. Also, Electrical Symbols on Dwg. E-7 and Diagram on Dwg. E-7 call for 60-Ampere while the above-specified model is a 32-Ampere Receptacle. Please Clarify.

RESPONSE: *Verified the part number with Matson in Honolulu. Verified with Wesco Hawaii (808 839-7261), that the part was listed in the current Mipco product catalog. The item is difficult to find, so the contractor should contact equipment*

supplier like Wesco to locate the item. Substitutions should be requested following the award.

35. Transient Suppression Protection Unit - No specifications. Please provide.

RESPONSE: An addition to the specifications for the Transient Voltage Surge Suppression (TVSS) Unit has been added by amendment.

36. Disconnect, Switches - No specifications. Please provide.

RESPONSE: An addition to the specifications for disconnect switches has been added by amendment.

37. Is there any existing concrete batch plant facility in the island that a contractor can use? What is the production capacity.

RESPONSE: The existing concrete batch plant will not be available.

38. Is there any US Army owned heavy equipment available for contractor use? (I.e. crane, trucks/trailer, forklifts, backhoes, pumps, etc). Please provide list including rental rates if available.

RESPONSE: The on-island Army-owned equipment will not be available.

39. Can contractor buy gas/fuel for their equipment from U5 Army? Please provide cost of gas/fuel per gallon?

RESPONSE: Gas and diesel fuel will be available for purchase by the contractor. The 2002 rate for gas is \$1.07 per gallon, and the price of diesel is \$0.96 per gallon. There is also \$0.16 per gallon handling fee.

CLOSE CONSTRUCTION QUESTIONS:

40. Environmental Report: Please advise how we can obtain a copy of the hazmat survey prepared by Brewer Environmental. This report is referenced in SPEC Sections 13281 (Asbestos), 13282 (Lead Containing Paint), and 13286 (PCB). Please refer to SPEC Section 13281, par 1.3, page 6 and 13286, para 1.2(a), page 3 for specific reference to this report by BES.

RESPONSE: The survey report has been included in Amendment 0004.

NELSON REFRIGERATION QUESTIONS:

41. We are in receipt of Amend #4 on the above referenced project. We would like to clarify the requirements. The specification calls for all metals to be stainless steel if constructed in "exterior and non air conditioned space". Are the Cold-Storage Rooms (Prefabricated Panel Type) classified to be in a "non air conditioned space" requiring the metal clad skin to be stainless steel? Technically, the exterior side of the panels will not be in an air conditioned space.

RESPONSE: Please refer to Section 13038, para. 2.1 "The cold storage room shall conform to NSF 7 and to MIL-R-43900..." MIL-R-43900 refers to aluminum cladding.

42. Reference Specs: 15652 - 2.11 Ice Maker and Plans: Sht M-19 Ice Maker Schedule. The plans and specs call for (2) new ice makers. Although required capacities and accessories are provided a specific manufacturer "or equal" was not provided. Is there anyway the government can provide us with the manufacturer that the plans & specs where pattern on?

RESPONSE: *The specs were designed around Mannhardt and Vogt.*

PACIFIC INTERNATIONAL INC.

43. Section K- 10, (a), notes: "However, the contractor is advised that there may be limited numbers of skilled Marshallese available for hire for this Contract." We agree that this is the case for Marshallese who are residents of Ebeye in the Kwajalein Atoll. Our workforce includes skilled Marshallese who are not residents of Ebeye, and if we were to utilize them for this Contract, they would have to be housed. In reference to Section K-10, (d), please advise if Marshallese will be granted the necessary permission from the Commander USAKA to reside in Contractors camp on Kwajalein Island.

RESPONSE: *The housing of Marshallese workers on USAKA controlled islands, in this case Kwajalein Island, is not allowed in accordance with USAKA Regulation 190-10. An exception to policy would need to be submitted through the Corps of Engineers, Kwajalein Resident Office to USAKA Public Works. This request must be staffed through the Provost Marshal and Security offices to the Commander, USAKA, for approval. Each exception request is evaluated on a case-by-case basis and approved or disapproved. In the event that the contractor is asking for a group of Marshallese to live in his mancamp facilities, the exception can be processed for the group of Marshallese citizens/workers. Each individual does not have to be a separate request for exception.*

J.A. JONES CONSTRUCTION QUESTIONS:

44. Cold Storage Facilities:

a. Referring to the Concrete topping slab for the refrigerated and Freezer rooms, Section 03300, 1.7.3 at the end of the paragraph says that "in no case shall the slump exceed 25 mm as determined by ASTM C 143". For workability purposes, could the slump be increased to 75 mm as required for other slabs in section 03300, 1.6.4 – Slump.

RESPONSE: *Per Section 03300, 1.7.3, slump for refrigerator and freezer slabs shall have a maximum slump of 25mm.*

b. What is the interior finish of the insulated panels of the refrigerated and freezer rooms? The drawings show them as metal clad insulated panels. Please indicate the desired finish.

RESPONSE: *Per MIL-R-43900B, interior finish of the insulated panels shall be patterned aluminum, 0.040 inch thick, per manufacturer's standard finish.*

c. Please Define Hardware Set # 2. Refrigerated Room Manufacturers are requesting this information.

RESPONSE: *Per MIL-R-43900B, door hardware shall be of stainless steel. Standard cold storage door hinges shall be furnished on all refrigerated or freezer doors and shall be self-closing type with stainless steel pins and nylon cam type bearings. For sliding doors, ball bearing trolley rollers shall be provided on the overhead track. Hardware, overhead track and floor guides shall be stainless steel. The door latch and striker shall be of the adjustable type and shall be provisions for a padlock. The latch shall have provisions for being opened from the inside, when locked from outside, without damage to the door latch assembly. Safety release is required for both swing and slide type doors.*

45. Water Tanks: Will the government provide at no cost all the water required for testing the tanks and for the construction as well?

RESPONSE:

46. Cold Storage Ice makers:

a. Type = cubes, crushed, or tube?

RESPONSE: *Tube Ice.*

b. Is the bagger to be part of the storage bin or a separate piece of equipment?

RESPONSE: *Bagger is attached to the ice storage bin.*

c. Capacity of bagger?

RESPONSE: *Bagger should be setup to fill 20 lb bags of ice, but should be capable of filling 10 to 50 lb bags.*

d. Are there any physical size requirements/restrictions for this equipment?

RESPONSE: *Ice making capacities and storage are included in the Mechanical Equipment Schedules on the drawings. Equipment furnished must fit in the allotted space.*

e. Any more information available i.e. similar make & model?

RESPONSE: *Equipment used for the design was Vogt and Mannhardt.*

47. Cold Storage rooms:

a. Finish/color (insulated panels)?

RESPONSE: *See Specs. Reference to MIL-R-43900B. Patterned .04 inch thick aluminum.*

b. Hardware requirements for all doors?

RESPONSE: For non-clad storage room doors see spec section 8700 paragraph 3.2 hardware sets. For cold storage room doors see attachment (from Specs-Intact) MIL-R-43900B.

c. Please verify the details and requirements for door D-17 (that type of door is not available as fire rated)?

RESPONSE: Details and requirements per attached MIL-R-43900B. Fire rated cold storage room doors are available. See attached catalog as example.

UTILITY OUTAGE COORDINATION RECORD

A. Type of utility requiring an outage: _____ Potable Water
_____ Salt Water
_____ Electrical
_____ Telephone
_____ Other(Specify) : _____

B. Specific location of work (Identify manhole no., transformer bldg., or Include detailed sketch when applicable) : _____

C. Proposed date(s) of outage: _____ D. Time/Duration: _____

E. User coordinations made:

<u>AFFECTED FACILITY</u>	<u>PERSON CONTACTED/TEL NO.</u>	<u>USER COMMENTS</u>
1 _____	_____	_____
2 _____	_____	_____
3 _____	_____	_____
4 _____	_____	_____
5 _____	_____	_____

COORDINATOR: _____
SIGNATURE/CONTRACTOR'S POC

CONCUR: _____
SIGNATURE/UTILITIES MANAGER

APPROVED: _____
CONTRACTING OFFICER'S REP.
KWAJALEIN RESIDENT OFFICE

SUMMARIZATION OF AIRBORNE ASBESTOS SAMPLING RESULTS

(EFAR 52.2/9009)

CORPS DISTRICT	WORK LOCATION (Installation, Building, Room, City, State)	CONTRACT NO.
AMOUNT OF ASBESTOS _____ SQ. FT. _____ LINEAR FT. WORK AREA DIMENSIONS _____ L x _____ W x _____ H		
ASBESTOS INVOLVED	<input type="checkbox"/> FRIABLE <input type="checkbox"/> NON-FRIABLE	
TYPE OF MATERIAL	<input type="checkbox"/> CEILING TILE <input type="checkbox"/> FLOOR TILE <input type="checkbox"/> SPRAY-ON <input type="checkbox"/> ROOFING <input type="checkbox"/> WALL PANELS <input type="checkbox"/> CLOTH <input type="checkbox"/> PIPE LAGGING <input type="checkbox"/> PLASTER MUD <input type="checkbox"/> PAPER SHEET <input type="checkbox"/> GASKET <input type="checkbox"/> ROPE <input type="checkbox"/> OTHER	
TYPE OF ACTION	<input type="checkbox"/> REMOVAL <input type="checkbox"/> ENCLOSURE <input type="checkbox"/> ENCAPSULATION <input type="checkbox"/> OTHER	
WET METHODS	<input type="checkbox"/> ON WORK <input type="checkbox"/> ON WASTE <input type="checkbox"/> AMENDED WATER <input type="checkbox"/> NOT USED	
WASTE HANDLING	<input type="checkbox"/> SHIFT END <input type="checkbox"/> 2X/SHIFT <input type="checkbox"/> CONTINUOUS <input type="checkbox"/> ACCEPTABLE	
BARRIER FILMS	<input type="checkbox"/> FLOOR <input type="checkbox"/> WALL <input type="checkbox"/> CEILING <input type="checkbox"/> DOUBLE <input type="checkbox"/> AIR VENTS <input type="checkbox"/> OTHER <input type="checkbox"/> NONE	
WORK ZONE PRESSURE DIFFERENTIAL	<input type="checkbox"/> NEGATIVE <input type="checkbox"/> POSITIVE <input type="checkbox"/> AMBIENT <input type="checkbox"/> NONE	
CAUTION SIGNS	<input type="checkbox"/> PERIMETER <input type="checkbox"/> DUMPSTER <input type="checkbox"/> WASTE BAGS	
SITE ISOLATION	<input type="checkbox"/> PERIMETER <input type="checkbox"/> AIRLOCK <input type="checkbox"/> DUCTS <input type="checkbox"/> OTHER	
WORK PRACTICES	<input type="checkbox"/> HEPA VACUUM <input type="checkbox"/> MICROTRAP <input type="checkbox"/> CHANGE ROOM <input type="checkbox"/> SHOWERS	
RESPIRATORS	<input type="checkbox"/> SUPPLY AIR <input type="checkbox"/> PAPR <input type="checkbox"/> AIR PURIFYING (Neg. Press.) <input type="checkbox"/> SINGLE USE <input type="checkbox"/> REUSABLE <input type="checkbox"/> NONE	
PROTECTIVE CLOTHING	<input type="checkbox"/> DISPOSABLE <input type="checkbox"/> REUSABLE <input type="checkbox"/> SHOE COVERS <input type="checkbox"/> GLOVES	

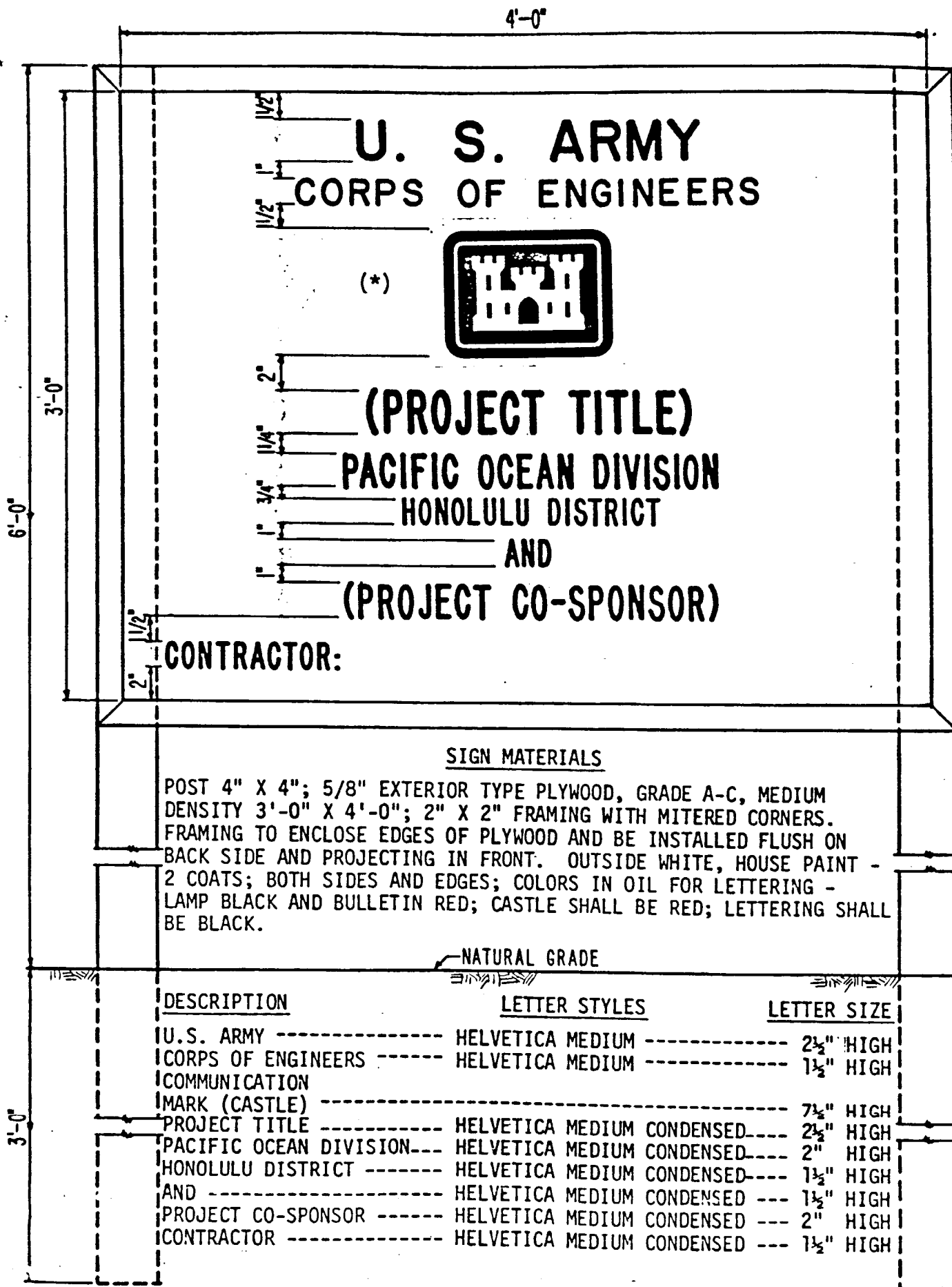
SUMMARY OF SAMPLING RESULTS

CEILING VALUES		TWA VALUES				
FIBERS/CC	OPERATION	FIBERS/CC	SAMPLE HRS.	A/P*	B/D/P/O**	OPERATION

* A/P (A-Area Sample; P-Personal Sample)

** B/D/P/O (B-Baseline; D-Daily; P-Post-Clean; O-Other)

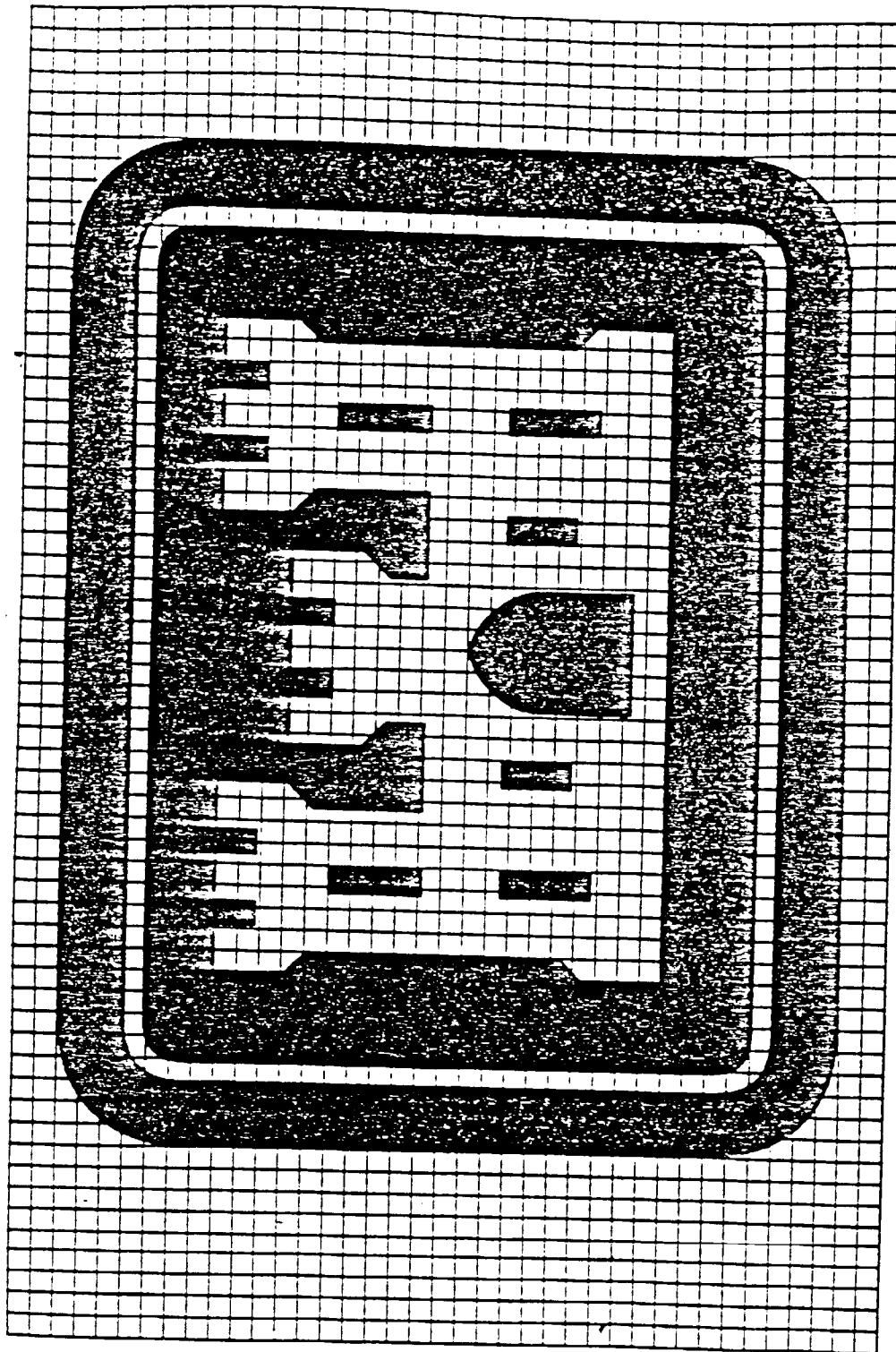
CIH NAME (Typed/Printed)	SIGNATURE	DATE	ASIH CERTIFICATION NO.



* SEE DWG NO. 40-21-06 FOR GRID DRAWING.

PROJECT SIGN

DWG. NO. 40-21-04



NOTE: The proportions shown are to be followed exactly when manually reproducing the mark at extremely large sizes. Background - Red; Castle - White.

GRID DRAWING OF COMMUNICATION MARK

DWG. NO. 40-21-06

List of Drawings
Drawings dated Sept 98

FY99 ECIP, Lighting Upgrade, Kwajalein Island

Ring Number	Description	Sheet
1	Project Title, Schedule of Drawing Abbreviations List, Location Map	T-1
2	Building 806, Mechanical Floor Plan	M-1
3	Building 1002, Mechanical Floor Plan	M-2
4	Building 1008, Mechanical Floor Plan	M-3
5	Building 1017, Mechanical Floor Plan	M-4
6	Electrical Symbols, General Notes, Light Fixture, Schedule Equipment Schedules	E-1
7	Electrical Site Plan	E-2
8	Bldg 357 Lighting Plan –First Floor, Bldg 357 Lighting Plan – Second Plan	E-3
9	Bldg 602 Lighting Plan – First Floor, Lighting Control Plan	E-4
10	Bldg 605 Lighting Plan	E-5
11	Bldg 607 Lighting Plan	E-6
12	Bldg 804 Lighting Plan – First Floor Bldg 804 Lighting Plan – Second Floor, Lighting Control Diagram	E-7
13	Bldg 805 Lighting Plan- Second Floor	E-8
14	Bldg 806 Electrical Plan – First Floor Bldg. 806 Lighting Plan – Second Floor	E-9
15	Bldg 808 Lighting Plan – First Floor, Lighting Control Diagram	E-10
16	Bldg 808 Lighting Plan – Second Floor, Lighting Control Diagram, Details	E-11
17	Bldg 901 Lighting Plan – First Floor	E-12
18	Bldg 904 Lighting Plan – First Floor, Bldg 904 Lighting Plan – Second Floor	E-13
19	Bldg 908 Lighting Plan – First Floor Bldg 908 Lighting Plan – Second Floor, Bldg 908 Lighting Plan – Third Floor	E-14
20	Bldg 988 Lighting Plan	E-15
21	Bldg 1002 Electrical Plan	E-16
22	Bldg 1008 Electrical Plan	E-17
23	Bldg 1009 Lighting Plan	E-18
24	Bldg 1017 Electrical Plan	E-19
25	Bldg 1060 Lighting Plan	E-20
26	Bldg 1659 Lighting Plan	E-21

SPI 1310
MAY 1995
ATTACHMENT A

**KWAJALEIN LOGISTICS SUPPORT
MECHANICAL DIGGING PERMIT**

Date submitted _____

LOCATION OF DIG: _____

SUPERVISOR IN CHARGE: _____

ESTIMATED DURATION OF ACTUAL MECHANICAL DIGGING: _____

SIGNATURES:

1. TELEPHONE REPRESENTATIVE _____

PHONE NUMBERS:

ON KWAJ: 1123/1356

ON ROI: 6311

ON MECK: 2960

2. KLS LIQUID PLANTS (UTILITIES): _____

PHONE NUMBERS:

ON KWAJ: 1847

ON ROI: 6361

ON MECK: 1166

3. KLS HIGH VOLTAGE SHOP (UTILITIES): _____

PHONE NUMBERS

ON KWAJ: 3426

ON ROI: 6361

ON MECK: 1166

4. KLS ELECTRIC SHOP (FOM): _____

PHONE NUMBERS

ON KWAJ: 1502

ON ROI: 6361

ON MECK: 1166

5. KLS ENVIRONMENTAL: _____

PHONE NUMBER

1134 / 1135

6. OTHERS: _____

KLS FORM 1310-A

Financial Policy and Rate Manual

Table of Contents

	<u>Page No.</u>
Foreword	
1. Purpose	B-1
2. Scope	B-1
3. References	B-1
4. Policy	B-1
Chapter 1	
1-1 Definitions	B-2
1-2 General Policy	B-3
1-3 Procedures	B-8
Chapter 2	
2-1 General	B-12
2-2 Aviation Services	B-12
2-3 Marine Services	B-15
2-4 Reproduction	B-18
2-5 Utilities	B-19
2-6 Bulk POL	B-20
2-7 Services to Individuals, Activities, and Businesses	B-20
a. Housing	B-20
(1) Permanent Housing	B-20
(2) Transient Housing	B-22
b. Meal Rates	B-23
c. Communication Services	B-24
d. School Tuition	B-25
e. Space Costs	B-26
f. Scuba Tanks	B-26
g. Mortuary Services	B-26
h. Rental of Vehicles, Equipment and Bicycles	B-27
i. Services to Non-Profit Organizations	B-27
j. Ice	B-27
k. Medical, Dental, and Veterinary	B-27
(1) General	B-27
(2) Fees	B-28
(3) Miscellaneous	B-28
Chapter 3	
3-1 General	B-32
3-2 Policy	B-32
3-3 Procedures	B-33

FINANCIAL MANAGEMENT
FINANCIAL POLICY AND RATE MANUAL
FOREWARD

1. PURPOSE. This manual sets forth financial policies, determinations, procedures, rates for logistic and technical support, and other applicable costs (i.e. load factors) in effect at the U.S. Army Kwajalein Atoll/Kwajalein Missile Range (USAKA/KMR). It provides the procedures for allocating these costs to each contractor and to each customer program. It describes how the additional costs for other government agencies and non-government customers are derived and applied.

2. SCOPE. This manual is applicable to range customers, tenants, and other agencies, organizations, and individuals who are eligible for support. Specific exclusions may be granted in an approved Interservice Support Agreement (ISA) in accordance with DoD directive 4000.19, Chapter 1, Para A4. It is not applicable to base support functions or projects conducted for the Commander, USAKA/KMR, in either his position as installation commander or as Commander in Chief Pacific Representative to the Republic of The Marshall Islands (CINCPACREPMAR).

3. REFERENCES.

a. AR 37-49, Budgeting, Funding, and Reimbursement for Base Operations of Army Activities.

b. AR 70-69, Major Range and Test Facility Base, 15 June 1982.

c. DoD Directive 3200.11, Major Range and Test Facility Base, September 29, 1980.

d. DoD Instruction 7230.7, User Charges.

e. DoD Regulation 4000.19, Base Policies and Principles for Interservice, Interdepartmental, and Interagency Support.

4. POLICY. To ensure compliance with DoD Directive 3200.11, Major Range and Test Facility Base (MRTFB) with changes in applying logistic support cost to customer programs. This includes those "ancillary variable indirect costs" that benefit customer programs. Further, to ensure control, accountability, and proper financial management of the funds generated in compliance with this manual.

The proponent of this manual is the USAKA/KMR Resource Management, Program Management Office.

FINANCIAL POLICY AND RATE MANUAL

CHAPTER 1

1-1. DEFINITIONS.

a. All Other Rates - Includes direct and indirect costs in accordance with DoD Instruction 7230.7. However, when the use of an activity has been included in a contractual agreement as Government furnished services, the user shall be charged based on the category of the contracting federal government agency. Foreign users shall reimburse the activity in accordance with DoD Instruction 2140.1 for Foreign Military Sales (FMS) cases, or DoD Instruction 7230.7 when no FMS case is involved.

b. Allocated Cost. The cost of base support to all Major Range and Test Facility Base (MRTFB) personnel and material resources. It will be allocated to customers, both MRTFB and cash. It will include the following support areas: Education Services, Food Service, Medical Services, Facilities Support Division, Transportation, Other Community Services, Other Support as applicable.

c. Contractors. The term contractor will cover only those contractors involved in directly supporting MRTFB customers. These include the Logistic Support Contractor (LSC), Security and Law Enforcement Contractor (SLEC), Meteorological Contractor (METs), and Integrated Range Engineering (IRE) contractor.

d. Direct Labor Base. The direct labor base is the direct labor dollars paid to employees based on the hours actually worked including overtime (less premium part of overtime). Included will be other applicable costs such as night differential, hazardous duty pay, etc. In addition, for the LSC, the definition for Direct Labor Base in CDRL AP06 (Indirect Rate/Support Cost Allocation Report) will also apply.

e. DoD Rate - Direct and allocated costs which can be identified readily with the particular program support, excluding military labor costs. Direct costs include labor, material, minor construction, utilities, equipment, supplies, and other resources damaged or consumed during testing or maintained for a particular user, and any other costs such as

maintenance that can be attributed directly or through proration to test or other use.

f. Inter-service, Interdepartmental or Interagency Support Agreements - Written, negotiated agreements between supplying and receiving activities which delineate support required, support to be provided, and funding responsibilities.

g. Other Federal Government Agency (OGA) Rate - Direct and allocated costs, including military labor, plus indirect costs, excluding military retirement, depreciation, and the unfunded portion of civilian retirement. Indirect costs include management and other costs which normally are not identifiable to a particular program.

h. Universal Documentation System (UDS) - A standard format used to set forth range customer requirements for common MRTFB services (including base support services required) to support a specific program, and the MRTFB commitments to support requirements. Amplifying or specific statement of funding responsibilities may be included in the UDS document. The UDS document may provide specific exclusions to the policies and rates in this manual.

1-2. GENERAL POLICY. General financial policies applicable to the major areas of base support are amplified in the following subparagraphs:

a. Services to DoD Components and Other Federal Government Agencies. Refer to formal agreements or Universal Documentation System (UDS) for specific USAKA/KMR commitments and delineations of funding responsibilities. In some cases, the agreements or the UDS may not be specific as to which organization supported (or organization versus individuals thereof) is responsible for actual payment of costs for reimbursable services. This occurs because these documents usually address the relationship between USASMD and another Federal Government agency (OGA). The OGA is frequently the sponsor for a complex of contractor and subcontractor organizations. Negotiations between the Federal Government and contractors, contractors and subcontractors, and contractors and employees, establish specific responsibilities for payment. Detailed definition of specific responsibilities from the sponsoring OGA is normally required. (This is supplemental to UDS and formal agreements.) In some

instances, lacking such detailed definition for a specific service, contract terms or personnel policies can be used to make an appropriate determination.

(1) Operation and Maintenance of Exclusively Assigned Facilities or Equipment - This effort is accomplished on a reimbursable basis. The USAKA/KMR Logistic Support Contractor (LSC) and the Security and Law Enforcement Contractor (SLEC) provide personnel on a continuing basis in direct support of customer programs. Lincoln Labs (LL), Kiernan Reentry Measurements Site (KREMS) scientific advisor provides support on a continuing basis for customer programs. Reimbursement for these efforts includes direct labor, allocable costs, and material cost plus other applicable direct costs (i.e., transportation, supplies and services).

(2) Air Transportation - Fixed and rotary wing aircraft are operated for the movement of passengers, mail and other cargo among various islands of USAKA/KMR. Flights to meet requirements of range customers or tenants, such as support of major construction (MCA) efforts, movement of range customer or tenant personnel, aerial surveillance, photo mission support and weather reconnaissance, beacon-carrying flights for radar calibration and flights for launch of target spheres, are reimbursable. (See Chapter 2 for rates.)

(3) Marine Transportation - Marine vessels are operated for the transportation of personnel and cargo among various islands of USAKA/KMR. Trips to meet requirements of range customers or tenants, such as personnel transportation, support of major construction (MCA) or major installation (i.e., a new radar) and transportation of project equipment in support of project requirements are reimbursable. (See Chapter 2 for rates.)

(4) Emergency Aid Services

(a) Emergency calls from U.S. Coast Guard (USCG) to request medical evacuation of ship crew members: The cost of efforts expended in direct response to USCG requests to evacuate patients from ships is not reimbursable (i.e., transportation costs and other costs related to evacuation). The costs of hospitalization, subsistence, medication, etc., will be collected from recipient individuals upon release from the hospital, unless a determination of indigence is made (refer to AR 40-3).

(b) Search and rescue (including medical evacuation) assistance rendered in response to USCG request is to be nonreimbursable (except as stated in (c) below) and on a noninterference basis with USAKA/KMR mission requirements. In regard to noninterference, the Commander (Cdr), USAKA/KMR must determine if commitment of USAKA/KMR resources to USCG search and rescue efforts will adversely affect the capability to satisfy USAKA/KMR mission requirements.

(c) Support of Republic of the Marshall Islands (RMI) requests for emergency assistance: The costs associated with lifesaving transportation, search and rescue operations, and airlift or sealift of supplies rendered RMI inhabitants whether by direct or indirect (via USCG) requests, will be recovered from RMI.

(d) Urgent lifesaving missions will not be delayed pending receipt of a formal request (USCG or RMI), if the Cdr, USAKA/KMR determines to the best of his ability and upon information available that immediate action is appropriate. USAKA/KMR activities are not to compete with commercial capabilities for evacuation unless conditions dictate.

(5) Administrative Use Vehicles - The use of automotive vehicles (including maintenance thereof) is provided within overall resources available to meet the valid requirements of range customers and tenants at USAKA/KMR. Vehicles must be used within the guidelines of the Commanding General, USASMD; Cdr, USAKA/KMR; and statutory provisions (delineated within Army Regulation 58-1). Maximum use of pool vehicles versus assigned vehicles must be made. Vehicles are to be used for official business only. Reimbursement (operating and maintenance costs) is required for dispatch vehicles.

(6) Scheduled Bus Service - Bus service is provided on the islands of Kwajalein and Roi-Namur. Routes and schedules are established to provide services between key areas and at key times to meet the needs of large numbers of residents. These services are provided on a non-reimbursable basis.

(7) Special Equipment - The use of construction, maintenance, and materials handling equipment is provided on a reimbursable basis to the extent available to meet short-term requirements. Unless the requester has a fully qualified operator, an operator will be provided on a reimbursable basis. USAKA/KMR cannot normally provide equipment for long

term, full-time usage. With adequate lead-time notification and provision of funds by the requestor, USAKA/KMR may, if specifics indicate overall advantage, procure (purchase/rent) common items of equipment for range customers through established channels when requirements cannot otherwise be met by USAKA/KMR. In these cases, payment for use charges comparable to established Federal Government rates will be required.

(8) Data Processing - Data processing services are available within limitations of capability on a noninterference, reimbursable basis.

(9) Fire Prevention and Protection - Routine fire fighting and fire protection is provided on a non-reimbursable basis. Standby fire protection at any location, as for hazardous operations, will be provided on a reimbursable basis. Any special equipment that must be obtained for a specific customer requirement will also require reimbursement. Long term fire protection to meet the needs of a specific range customer will be reimbursable.

(10) Janitorial Services - The LSC will provide custodial services on a reimbursable basis for joint-use and sole-use facilities.

(11) Postal Services - The U.S. Postal Service provides handling of all classes of mail, registration, certification, insuring, sale of stamps and money orders, and rental of boxes are provided on Kwajalein Island at normal postal rates (except that privileges attendant to an "Army Post Office" address apply). A subordinate office is also operated at Roi-Namur.

(12) Office Furniture and Equipment - Common use items will be provided on a non-reimbursable basis as available from local stock. The LSC will procure common items not available from local stock on a reimbursable basis.

(13) Office Supplies - Routine office supplies will be provided on a reimbursable basis as available from local stock.

(14) Reproduction Services - Reproduction services are available from the LSC on a reimbursable basis. (See Chapter 2 for rates.)

(15) Security - General base security and police services are provided on a non-reimbursable basis. Services to meet specific user or tenant requirements are provided on a reimbursable basis.

(16) Services to Ships - Pilot services, line handling, stevedoring, potable water, and limited emergency repairs are provided on a reimbursable basis for transient marine vessels. (See Chapter 2 for rates.)

(17) Services Related to Off-Atoll Transportation - Normal air terminal services will be provided on a non-reimbursable basis. Packing, crating, and cargo handling will be provided on a reimbursable basis.

(18) Services to Aircraft - Ground handling, refueling, custodial, passenger/cargo processing, inspection and limited maintenance and emergency repairs are provided on a reimbursable basis for transient aircraft. (See Chapter 2 for rates.) Landing fees will be charged in accordance with AR 95-2.

(19) General Supplies (including POL) - Support will be limited to reimbursable issue of those items normally stocked by the LSC for USAKA/KMR mission support when such issues can be made without detriment to planned USAKA/KMR usages. Assistance in determining substitutes will be limited.

(20) Telephone - Local services are available. Off-atoll long distance telephone service is available for both official and non-official calls. (See Chapter 2 for rates and determination of reimbursable versus non-reimbursable services.)

(21) Electricity - Electricity is provided within the capacity of existing USAKA/KMR power plants and distribution systems. Reimbursement may be required at the option of the Cdr, USAKA/KMR, based upon specifics of the individual case. (See Chapter 2 for rates.)

(22) Potable Water - Potable water is provided to tenants and range customers within the capacities of existing systems. Reimbursement may be required at the option of the Cdr, USAKA/KMR, based upon specifics of the individual case. Potable water is provided to others (i.e., transient ships and RMI for indigenous personnel), when available, on a

reimbursable basis. (See Chapter 2 for rates.)

(23) Laundry - Laundry services are provided on a reimbursable basis.

(24) Housing - Housing (family and unaccompanied personnel) services are provided, subject to availability, on a reimbursable basis. (See Chapter 2 for rates.)

b. Services to USAKA/KMR Contractors and Other Federal Government Agencies Supporting USAKA/KMR - Base support services, the cost of which would otherwise be a direct cost under the contract or agreement for support of USAKA/KMR, are normally provided on a non-reimbursable basis.

c. Services to Other Organizations - See applicable formal agreement.

d. Services to Individuals - Numerous services are provided the individual residents at USAKA/KMR, and to a more limited extent, to transients. Typical services include billeting, dining, merchandising, recreation, medical and dental, religious, educational, barber, clubs, laundry and dry cleaning, postal services and repair of various types of equipment. In general, the costs of these services are reimbursed (exceptions are religious services and staff supervision of the recreational program). Explanatory comments and rates for major areas of services to individuals are included in Chapter 2.

1-3. PROCEDURES. The following Procedures are applicable:

a. Provision of Services - USAKA/KMR is a Government-owned (leased), contractor-operated (GOCO) installation. Services are provided primarily by contractors.

b. Prior Approval - Approval of the designated Federal Government representative having management responsibility for USAKA/KMR resources must be obtained prior to delivery of services, materials or supplies. This approval may be in the form of a specific contract provision (i.e., services to residents of USAKA/KMR required of the LSC); UDS; formal agreements; or, in the case of unanticipated requirements, specific onetime approvals. (See also paragraph 1-3.d, 1-3.i and 1-3.j below for prerequisite financial requirements applicable to reimbursable services, materials or supplies.)

c. Collection of Payments - The LSC has responsibility to collect for reimbursable services, materials, and supplies provided by USAKA/KMR through them except when an authorization to expend funds is accepted by USASMDC from another federal government agency. (See paragraph 1-3i, below, for procedures applicable to these exceptions.)

d. Ordering of Services - A purchase order with an advance deposit must be submitted to the LSC in support of requests for reimbursable services, materials or supplies (not applicable to individuals). For onetime requirements, the purchase order and the deposit must equal the total estimated amount of the services, material, or supplies. For continuing requirements, the purchase order and the advance deposit must be adequate to cover estimated requirements for a minimum period of a quarter. Exceptions to this general rule are set forth in the following subparagraphs:

(1) The advance deposit requirement may be waived by the Commander, USAKA/KMR, when a sponsoring DoD agency has guaranteed payment for the costs to be incurred and such arrangement has been consummated between USASMDC and the sponsoring DoD agency.

(2) In the case of a bona fide emergency, the Commander, USAKA/KMR, may waive the requirement for the advance deposit. In such an emergency situation, the recipient will be required to reimburse the LSC immediately thereafter or as soon as conditions permit.

(3) Advance deposits to cover estimated requirements for a shorter period than a quarter may be authorized by the Contracting Officer on a case-by-case basis.

(4) Advance deposit is not required for Federal Government activities or for allied military aircraft. However, the contractor shall assure that specific forms (purchase requests) required by each agency for billing purposes are properly executed by a responsible representative of that agency prior to provision of services.

e. Handling of Advance Deposits - The amount of the advance deposit will be reviewed quarterly for sufficiency IAW paragraph 1-3.d. above. Requests for increase of advance deposits or refunds shall be made as appropriate. All deposits received will be held in interest-bearing accounts at

the current passbook rate paid by the subcontractor banking facility at USAKA/KMR. Interest earned on deposits of \$1,000 or more shall be payable to the customer if the customer account is current. No interest is paid on deposits less than \$1,000. Interest on deposits over \$50,000 will be paid quarterly; interest on deposits between \$1,000 and \$50,000 will be paid annually. Upon termination of services, the LSC will either refund the deposit if invoices are paid in full, or offset balances due by reduction of the deposit and refund the remaining balance plus accrued interest.

f. Acknowledgement of Receipt - An authorized representative of the receiving activity or organization will be required to provide a written certification that services, materials, or supplies (as listed) were received and accepted.

g. Billing Procedure - The LSC will establish an individual account for each receiving activity or organization and will accumulate costs against these accounts. Billings to customers will normally be on a monthly basis. Collections will be made on the basis of the billing or invoice, and the customer's deposit will remain intact as security for the funding of future services.

h. Delinquent Accounts - Payment to the LSC is to be made within 30 days from the date of the billing. After that period, the account will be considered delinquent and the amount due will be deducted from the security deposit. If the debt is guaranteed by a sponsoring DoD organization, that organization will be notified. If no settlement has been received within 120 days from original billing, support may be suspended upon the direction of the Contracting Officer until the account has been settled.

i. DoD and OGA Accounts

(1) Accounts will be established with USASMDC for the costs of support of range customer programs/missions and for other services, materials and supplies to be delineated by the USASMDC Contracting Officer to the supporting USAKA/KMR contractor.

(2) Normally reimbursable support effort will not be authorized by USASMDC prior to receipt of certification of funds and/or receipt of written intent from the customer to fund for all direct costs. When procurement action by USAKA/KMR support contractors is required prior to customer

receipt of annual appropriations, a Military Interdepartmental Purchase Request (MIPR), DD-448, or other applicable work authorization must be provided by the customer and bear the annotation: "This document is issued for planning purposes and is not a certification of funds. Funds have been included in the FY _____ Operating Budget, and it is planned to fund this requirement subject to availability of funds." Appropriate funding documentation must be provided by range customers to USASMDC normally 90 days in advance of the scheduled support. Requests for exception will be made through the Commander, Kwajalein Missile Range.

j. LSC Services, Materials, and Supplies to Individuals - The above procedures do not apply to cash sales to individuals which are generally collected prior to or at the time of delivery. Special provisions to the policy governing billing and cash collection procedures are set forth below:

(1) Medical and dental bills (emergencies excepted) under \$50.00 are to be paid at the time the services are provided. Work related claims for Workers Compensation will be reported in accordance with current U.S. Department of Labor regulations.

(2) Services over \$50.00 such as school tuition, housing, medical, dental, catering, services provided by work order or other services where cash transactions are clearly impractical will be billed by the LSC to the individual.

(3) Monthly telephone charges will be billed each month in advance (installation and relocations charges excepted). However, if telephone bills are not paid within 60 days after the billing date, service will be discontinued. A regular installation charge will be required for service to be restored.

(4) All items billed are due and payable thirty (30) days after billing date with the exception of inpatient medical charges (see 1-3j (6) below). After 30 days the bills become delinquent and a penalty of \$10.00 or interest applied to the amount of the indebtedness at the rate established by the Secretary of the Treasury IAW 31 USC 3717 (a)(1), as of the date the amount became due or if the amount is in dispute when that amount becomes liquidated (determined), whichever is greater. This penalty will be added each month until the indebtedness is satisfied. Exceptions may be granted when a

billing is in dispute and resolution is being pursued actively.

(5) Individuals not responding within two months to delinquent accounts will be placed on a strictly cash basis for all services provided until the delinquent amount is paid in full.

(6) Inpatient medical charges will not be considered delinquent until four (4) months after the date of the first invoice to allow sufficient time for submission and payment of insurance claims. After that time, the provisions of 1-3j (4) above will apply.

(7) Charges for non-standard marine fuel and after hours use of the tractor for movement of marine craft will also be billed by the LSC to individuals who have established accounts for such purposes. Accounts are established by payment of a \$100 refundable deposit at the LSC Finance Office.

k. Personal Checks - A charge of \$10.00 will be assessed for each returned personal check.

l. Standard Rates - When a standard rate does not exist, the Logistic Contractor will use the following procedure to determine the amount to be billed. This will apply to MRTFB customers and cash customers. Material will be at actual cost plus applicable load. Direct Labor will be the average direct labor rate for each category of labor. This will be increased by the actual indirect labor rate (Fee, G&A, Fringe and Management) for the logistic contractor plus a rate for the allocated support cost (Education, Housing, Medical, Utilities, Maintenance and Amenities.) The indirect rate will be taken from the CDRL Work Sheet, Section III ****RECAP OF ALL LOADING COMPONENTS. The allocation rate will be determined by using the dollars allocated to the LSC in Step 4. of the allocation procedures, Chapter 3, paragraph 3-3d. This is the logistic contractor's share of the allocable cost.

To arrive at logistic contractor's direct base, the Range User Labor Base costs in Section III, CDRL AP06 Work Sheet will be used. Compute the rate by dividing the allocated costs (Step 4) by the direct labor base (Range User Labor Base).

FINANCIAL POLICY AND RATE MANUAL

CHAPTER 2

2-1. GENERAL. This chapter sets forth rates for Logistical Support in effect at the U.S. Army Kwajalein Atoll/Kwajalein Missile Range (USAKA/KMR). Any applicable allocated support cost is included in the rate unless specifically indicated otherwise. The Logistics Contractor will request contracting officer approval to revise these rates based on actual cost of services and/or as new services are implemented or USAKA/KMR policy requires.

2-2. AVIATION SERVICES.

a. Use of Aircraft

(1) Dedicated Aircraft - per flying hour

Aircraft type	DoD Rate	OGA Rate	Others Rate
DHC-7	\$3,109	\$4,171	\$4,171
UH-1	\$1,946	\$2,960	\$2,960

(2) Passenger Service - per flying hour

Aircraft type	DoD Rate	OGA Rate	Others Rate
DHC-7	\$ 57	\$ 68	\$ 68
UH-1	\$158	\$188	\$188

(3) Passenger Service - space available

Aircraft type	DoD Rate	OGA Rate	Others Rate
DHC-7	\$0	\$0	\$10.00*
UH-1	\$0	\$0	not allowed

*This is an administrative charge for one-way trip.

b. Support to Transient Aircraft

(1) Landing, Parking, and Storage Fees

(a) These fees are applicable to commercial aircraft only. Military aircraft are not charged landing and parking fees.

(b) Landing fees are based on the maximum gross take off weight (MGTOW) of the aircraft at the rate of \$1.70 per 1000 lbs. IAW AR 95-2, Table 17-1, landing and parking fees are not collected from military aircraft. In addition, the commander can waive collection of landing and parking fees. Charges applicable to commercial aircraft routinely transmitting through USAKA/KMR are as follows:

Type of aircraft	Landing Fee
Boeing 727/737	\$182
DC-8	\$447
Dornier 228	\$ 15

(c) Parking fees are as follows:

MGTOW of aircraft	Type of aircraft	Parking Fee
under 12,500	Dornier 228	\$15
12,500-39,999		\$30
40,000 or more	Boeing 727/737, DC-8	\$60

No parking fees are charged for the first six hours. Fees after that period are charged per 24-hour period or any fraction thereof.

(d) Storage of commercial aircraft is not available.

(2) Ground Services

(a) Charges applicable during standard hours of operation (0730 - 2200 daily)

Aircraft Type	Cargo Only	Passenger Only	Passenger and Cargo
C5A/similar	\$343	\$442	\$841
C141/similar	\$343	\$442	\$644
C130/similar	\$343	\$300	\$450
C12/similar	NA	\$175	NA
DC-8/similar	\$343	\$442	\$564
727/737	NA	\$349	NA
Dornier 228	NA	\$ 92	NA

(b) Charges applicable during non-standard hours of operation (2200 - 0730 daily):

Aircraft Type	Cargo Only	Passenger Only	Passenger and Cargo
C5A/similar	\$761	\$ 855	\$1,240
C141/similar	\$761	\$ 855	\$1,200
C130/similar	\$761	\$ 761	\$ 761
C12/similar	NA	\$ 600	NA
DC-8/similar	NA	\$ 855	\$1,200
727/737	NA	\$1,043	NA
Dornier 228	NA	\$ 543	NA

(3) Refueling Charges

(a) Aircraft with a Defense Fuel Supply Center (DESC) identification plate will be charged directly through DESC.

(b) Aircraft without a DESC identification plate will be charged the cost of fuel and a refueling service charge as follows:

Aircraft Type	Standard Hours	Non-Standard Hours
DC-8/similar	\$80	\$141
727/737	\$37	\$141
Dornier 228	\$26	\$ 80

(4) Charges for non-routine services (e.g. maintenance) will be billed on an actual labor-hour basis plus applicable load factor. Materials will be billed at inventory cost plus applicable load factor.

2-3. MARINE SERVICES

a. Marine Vessels

(1) General. All rates include crew. Round trip cost will be billed to the requesting organization. Other organizations may move cargo on these vessels space available at no charge. Only sanctioned organizations may rent the vessels other than DoD and corporate accounts. Provisioning (meals) will be billed separately. All rates will be billed to the next full hour for any portion of an hour.

(a) Operational time (Operational Rate) is actual time underway.

(b) Standby time (Standby Rate) is the time from landing to departure with engines shut down and for Startup/Shutdown procedures.

(c) Startup and Shutdown procedures (pre-ops, post-ops) will be charged as Standby time. This time is used for engine warm up, machinery/safety checks, and setup/teardown of

required equipment. If extra time is required to on-load/off-load space available cargo, such time will be charged to the organization requesting shipment of that cargo.

CLASS	PRE-OP/POST-OP TIME	TOTAL TIME
LCM	1/2 hr	1 hr
LCU-1600	1/2 hr	1 hr
LCU-2000	1 hr	2 hr
Catamaran	1/2 hr	1 hr
Tug	1 hr	2 hr
Worthy	1 hr	2 hr

(2) Vessel Usage Charges

(a) DoD Rates (Hourly): (i.e. Army, Navy, Coast Guard, BMDO, other Range customers)

VESSEL	OPERATIONA L RATE	STANDBY RATE	*DAILY RATE
LCM	\$207	\$181	NA
1600 LCU	\$301	\$275	NA
2000 LCU	\$391	\$301	\$8,094
Catamaran	\$553	\$468	NA
Tug	\$552	\$432	\$8,184
Worthy	\$413	\$307	\$8,590
Barges	\$106	\$106	\$2,424
Syncrolift	\$5000/lift (i.e. vessel pulled out of water)		

(b) Non-DoD Rates (Hourly): (i.e. DOE, RMI)

VESSEL	OPERATIONAL RATE	STANDBY RATE	*DAILY RATE
LCM	\$394	\$368	None
1600 LCU	\$457	\$431	None
2000 LCU	\$561	\$471	\$ 8,094
Catamaran	\$982	\$897	None
Tug	\$552	\$432	\$11,227
Worthy	\$2,473	\$2,359	\$39,408
Barges	\$168	\$168	\$4,032
Syncrolift	\$5000/lift (i.e. vessel pulled out of water)		

* Daily rates are for vessels used over a 24-hour period.

(c) Recreational Rates (Hourly):

VESSEL	RUNNING / STANDBY
LCM	\$150 / \$124
1600 LCU	\$170 / \$144
2000 LCU	\$310 / \$220
Catamaran	\$380 / \$295
Tug	None
Worthy	None
Barges	None
Syncrolift	\$5,000/lift

c. Port Services Charges

(1) Piloting (Riding Advisor)

(a) Piloting for arrival/departure into Kwajalein is a flat \$750 round trip (\$375/\$375) with delivery of pilot included into the cost.

(b) Piloting for harbor shifts is \$150 per shift.

(2) Stevedoring and Drayage

(a) Line handling at Kwajalein pier is \$150 per callout.

(b) Stevedoring and drayage service is actual labor and materials billed to account plus load factors.

(3) Recreational Small Boats

(a) When it is necessary to use recreational boats for base support purposes, base support funds will be paid at a rate of \$32.35 per hour.

(b) Recreational boat charges are approved as part of the Recreation Fund budget and available from Community Services.

(4) Vessel Booming (Oil Booming) is required at Kwajalein for all vessels transferring more than 499 gallons of petroleum-based products or petroleum/hazardous tainted products. Vessel Booming is a flat rate of \$400 per operation. Any fuel or oil spill not associated with normal booming of the vessel will be charged depending on the recovery effort required for the spill.

(5) Equipment, materials and/or services provided, and not covered by this manual, are subject to charge at comparable rates established by other federal government agencies and will be applied as necessary.

2-4. REPRODUCTION

The following rates apply to reproduction services:

BLACK AND WHITE		
	1-sided	2-sided
Letter/Legal - 20 lb Bond	\$0.07	\$0.13
Letter/Legal - Pastels	\$0.10	\$0.16
Letter/Legal - Card Stock	\$0.18	\$0.24
Letter/legal - Customer Provided	\$0.06	\$0.12
11x17 - 20 lb Bond	\$0.14	\$0.26
11x17 - Pastels	\$0.20	\$0.32
11x17 - Card Stock	\$0.36	\$0.48
11x17 - Customer Provided Stock	\$0.12	\$0.24
Labels	\$1.00	N/A
Transparencies	\$1.00	N/A
Tabs (bank of 5)	\$2.00	N/A

FULL COLOR		
Letter/Legal	\$1.00	
11x17	\$1.90	
Transparencies	\$2.00	
Glossy & Card Stock	add .25/print	

SPOT COLOR		
Letter/Legal - 20 lb Bond	\$0.13	
Letter/Legal - pastels & coated	\$0.16	
Letter/Legal - Card Stock	\$0.24	
Cost for each additional color	\$0.06	

FINISHING	
Binding/Handling:	
Spiral	\$2.45
Inline Thermal	\$2.00
Inline Booklet Stapling	\$0.25
Machine Folding	\$0.02/page
Machine Stapling	\$0.02/staple
Hand Folding	\$0.10/page
Hand Stapling	\$0.10/staple
Hand Collating	\$0.10/page
Hand Insertion	\$0.10/page
Cutting	\$1.00/cut

2-5. UTILITIES

a. Potable Water: \$11.38 per thousand gallons for all users. Transportation, if required, is billed separately.

b. Electrical Power

(1) Standard Rates

Kwajalein	\$0.101/KWH
Roi-Namur	\$0.182/KWH
Carlos	\$0.331/KWH

Kwajalein	\$0.101/KWH
Meck	\$0.176/KWH

(2) A demand charge based on actual costs for operation and maintenance of additional generating capacity for a specific user may be required.

2-6. BULK POL - Prices for bulk POL products are the standard prices disseminated by Director, Defense Energy Support Center (DESC). USAKA/KMR retail POL customers (any customer other than authorized DoD aircraft using approved DESC Identiplate (DD 1896) and/or authorized DoD Marine Vessel using (DD 1149) will be billed an additional \$0.15 per gallon handling charge.

2-7. SERVICES TO INDIVIDUALS, ACTIVITIES, AND BUSINESSES

a. Housing

(1) Permanent Housing

(a) Housing rates include utilities (except telephone) and furnishings.

(b) The rental period is the calendar month commencing on the first day of each month. Personnel commencing occupancy or vacating housing on a day other than the first day of the month will be charged a pro rata share of the monthly rent based upon the number of days of actual occupancy during the month. In calculating pro rata amounts, a 30-day month will be used as the standard rental period regardless of the number of days in the actual calendar month. The first day of occupancy will be charged as a rental day and the vacating day will be considered a non-rental day.

(c) Accompanied military personnel and bona fide bachelors assigned to USAKA/KMR and occupying unaccompanied personnel housing or concrete family housing will pay the published rental rate or 75% of quarters allowance (i.e. BAQ), whichever is less. Military personnel occupying facilities 112-139, 402 and 404 will pay the published rental rate or 100% of quarters allowance, whichever is less. Military personnel in an unaccompanied status as a geographical bachelor will be provided housing at no cost to the individual.

(d) Individual personnel employed by the LSC, SLEC, METS, and IRE Contractors, as well as MIT/LL and FAA personnel are not required to pay rent for housing as it is Government

furnished under these contracts/agreements. Also, U.S.

Government Civil Service personnel assigned to USAKA/KMR are not required to pay rent as they do not receive overseas housing allowance while stationed at USAKA/KMR.

(e) All others are required to pay the established rental rate. Payment may be made by the individual or the sponsoring organization as established in the application agreement or contract. When rent is paid by the sponsoring organization, billing will be made for housing assigned. Billing begins upon assignment if the unit is vacant or when vacated by the previous occupant.

(f) Billing for housing will be made at the end of the month except when housing is surrendered during the month.

(g) Monthly Rental Rates

Bachelor Quarters - Kwajalein	
Pacific Barracks (Bldg 708)	
Two per room	\$200/person
Three per room	\$175/person
Four per room	\$150/person
Six or seven per room	\$125/person
Ocean Barracks (Bldg 560, 3 per room)	\$175/person
Surf, Palm, Shell, Coral, Reef, Tropics & Sands BQs (Bldgs 501, 512 and 561-565)	
One per room with bath	\$800/person
Two per room with bath	\$300/person
Trailers	
One per trailer	\$750/person
Two per trailer	\$400/person
Bachelor Quarters - Roi-Namur	
Bldg 8115	\$120/person
Bldgs 8011, 8012, 8103, 8114	
One per room with bath	\$800/person
Two per room with bath	\$300/person

Family Housing	
Facility Numbers 102-106 and 202-241,402 and 404	
One Bedroom	\$ 900
Two Bedroom	\$1,000
Three Bedroom	\$1,200
Facility Numbers 112 - 139	
Two Bedrooms	\$1,100
Three Bedrooms	\$1,400
Facility Numbers 401-497(except 402 and 404)	
One Bedroom	\$ 750
Two Bedrooms	\$ 900
Three Bedrooms	\$1,100
Trailers	\$ 750

(2) Transient Housing

(a) Rates include utilities, furnishing, towels, linen, telephone access, and custodial services.

(b) The check-in time is 1430; check-out time is 1200. Personnel checking out after 1200 will be charged for an additional day.

(c) Individual personnel employed by the IRE, LSC, SLEC, METS contractors, MIT/LL and FAA personnel are not required to pay rent for lodging when on official business as it is Government furnished under these contracts/agreements.

(d) Military personnel in a PCS status may occupy transient housing up to three days at housing allowance rates. Extensions may be granted by the Cdr, USAKA/KMR on a case by case basis.

(e) All other transients are required to pay the established rental rate. Payment may be made by the individual or the sponsoring organization as established in the applicable agreement or contract.

(f) -Deleted-

(g) Transient Rental Rates

	Daily Rates Per Person
Kwajalein Island	
Kwaj Lodge	
DV Suite 216	\$85.00
DV Rooms	\$75.00
Single Room, Private Bath	\$75.00
Shared Room, Shared Bath	\$45.00
Bldg. 704 (Above Macy's)	
DV Room 218 (1 only)	\$75.00
Single Room, Private Bath	\$75.00
Shared Room	\$45.00
PBQ	\$20.00
Shared Room, Shared Bath	\$20.00
Vacation Trailer	\$20.00 (\$5.00 for each extra person)
Roi-Namur Island	
8017-Single Room, Shared Bath	\$50.00
20 Person Facility	\$15.00

Note: Bicycle Rentals are \$5.00 per day.

b. Meal Rates for Base Support Cafés

Meal	On-Island Rate	TDY Rate	Children under 12
Breakfast	\$ 4.50	\$ 6.00	
Lunch	\$ 6.00	\$ 9.00	
Dinner	\$ 6.00	\$ 9.00	
Brunch	\$ 7.50	\$12.00	\$3.25
Box Lunch	\$ 4.55		

Non-meal card holders (badged workers, family members and guests) are allowed to use the Cafés only as prescribed in

c. Communication Services

(1) Telephone

(a) Basic Service - Basic rates do not include toll calls. Charges for a fractional month service will be prorated. A new service, disconnect, or reconnect charge applies when installation or relocation is not required, or when relocation is not for the convenience of the government. NC indicates no charge.

Category of Use	Monthly Rate Single Line	Initial Installation/ Relocation	Disconnect/ Reconnect Charge
Private Use in Qtrs:			
Telephone	\$25.00	NC/\$25.00	NC/\$25.00
Extension	NC	\$25.00/25.00	NC/\$25.00

(b) Long Distance Service - \$.07 per minute is charged for all off-island calls. This includes collect, 1-800, 1-900, and all credit card calls, regardless of circuits involved. This is in addition to the cost of the toll billed on the appropriate credit card by the commercial carrier.

(c) Activities and Business Firms

Category of Use	Monthly Rate Single Line	Initial Installation/ Relocation	Disconnect/ Reconnect Charge
Telephone	\$30.00	\$40.00/\$40.00	NC/\$40.00
Extension	\$ 6.00	\$40.00/\$40.00	NC/\$40.00

(d) Special Equipment (in addition to basic service)

Item	Monthly Rate	Installation/Relocation Charge
Buzzer	NC	\$ 25.00
Extension Bell	NC	\$ 35.00
Extension Cord (15 or 20 ft)	NC	\$ 20.00
Plug and Jack	NC	\$ 25.00
Speakerphone	\$ 20.00	\$ 40.00
Six Button Set	\$ 10.00	\$ 40.00
Telephone/Intercom System*	\$200.00	\$400.00

*System is five 6-button phones, four lines and intercom

(e) Special Requests (Nonrecurring Charges)

Relocation of extension	\$25.00
Records change, changing of working phone from the name of one resident to the name of another within five days	NC

d. School Tuition

(1) The USAKA/KMR school system consists of an elementary school encompassing kindergarten through sixth grade and a junior-senior high school which is an accredited member of the North Central Association of Colleges and Secondary Schools. School tuition is determined annually. Either the sponsoring organization or the individual must reimburse USAKA/KMR at the tuition rate. (Military and civil service personnel are not charged school tuition as individuals; therefore, their sponsoring organization must reimburse USAKA/KMR.) Rates for Marshallese students who are not USAKA/KMR residents but are authorized to attend the USAKA/KMR school system IAW the Memorandum of Agreement between USASSDC and the Republic of the Marshall Islands are \$75.00 per month per student, grades 1 through 12, and \$35.00 per month per kindergarten students.

School tuition per student will be recommended each year (CDRL E02) for the following: Kindergarten, Elementary, Jr/Sr High School, KAPS, and SALK. The tuition rates will be based on actual costs of operating the schools.

e. Space Costs:

Area	Annual Rate
Office Space - Per square foot per year at Kwajalein, Roi-Namur, Meck	
- Air Conditioned	\$18.00
- Non-Air Conditioned	\$12.00
Hospital Space - Per square foot per year	\$36.00
Storage/Warehouse Space - Per square foot per year	
- Climate Controlled	\$8.00
- Non-Climate Controlled	\$5.00
**Minimum rental is 6 months	

f. Scuba tank inspection, testing, primary charging - \$22.00

(1) Services will be at the convenience of the Fire Department based on workload, personnel, and equipment availability. It shall be the responsibility of the owner to deliver tanks to the station.

(2) Tanks which require cleaning or do not pass inspection requirements will be returned to the owner without hydrostatic testing.

(3) Scuba tank valves must be removed by owner prior to inspection.

g. Mortuary Services. A fee of \$150.00 includes transfer

preparation, a transfer case, and transport to ferry or air terminal. Additional charges of cost plus 25% may be incurred for coffin. Charges will be non-reimbursable for LSC employees. Charges for other individuals will be directed to the USAKA/KMR employer, RMI, or an individual as applicable.

h. Rental of Vehicles, Equipment and Bicycles - Rental rates are updated periodically and are available from the Automotive Department. Minimum charge for rental of any vehicle is \$5.00. Bicycle rental is \$5.00 per day.

i. Bona fide non-profit charitable organizations - Services provided will include 25% load factor on all labor and materials for routine work order requests.

j. Ice - Bagged ice at the ice plant is \$1.00 per bag for all customers except the logistic contractor's Facilities Engineering Services, who may obtain free of charge during the hours of 0730 and 1000.

k. Medical, Dental, and Veterinary

(1) General

(a) The LSC shall provide medical/dental care and services to the following on a non-reimbursable basis:

(1) Active duty military personnel and their dependents

(2) -Deleted-

(3) U.S. Department of Labor Job Corps trainees in accordance with the USAKA/KMR/USDOL Operational Support MOA. Includes only initial medical examinations/treatment. Additional medical/dental care is reimbursable.

(4) Indigenous residents of the RMI whose health care benefits have been "grandfathered" under the provisions of Article VIII, paragraph 3 of the US/RMI Military Use and Operating Rights Agreement (MUORA) and Contract DASG60-94-C-0067 clause H-12.a. NOTE: Dental care is not a grandfathered non-reimbursable benefit.

(b) The LSC shall provide medical/dental care and services to the following on a reimbursable basis:

(1) Civilian employees of the U.S. Government and their dependents, U.S. Government agencies, including active duty non-Army military personnel, Coast Guard personnel, Department of Defense contractors, and all other civilians including transients.

(2) Indigenous residents of the RMI, other than the Grandfathered personnel, will have all provisions of services preceded by a letter of authorization from RMI authorities. Except in cases of emergency stabilization. Full charges for services shall be billed directly to the RMI.

(3) The authorized Peace Corps office will be billed for services provided. Billing action to be supported by DD Form 7 and Peace Corps letter of authorization.

(4) Retired military personnel and dependents.

(5) Tripler Army Medical Center shall be billed for services provided to Active Duty and Active Reserve U.S. Army personnel. Tripler bills shall be accompanied by a letter of verification from the USAKA/KMR Medical/Dental evaluator.

(6) Grandfathered indigenous RMI employees shall be charged for dental care received from the USAKA/KMR Dental Department.

(2) Medical, Dental, & Veterinary Fees:

(a) Medical, dental & veterinary fees are recommended by Chief Medical Officer (CMO), Kwajalein Hospital and approved by Contracting Officer. A copy of the approved fee tables for all services are available for review at the reception desks of the hospital and dental clinic.

(3) Miscellaneous:

(a) Ambulance Transport: \$50.00/call

(b) Recompression Chamber Use: (Does not include Physician's fee)

Acute decompression sickness, air embolism, etc.

First hour	\$330.00
Each subsequent one-half hour	\$165.00

Hyperbaric oxygen treatment of gangrene, ulcers, etc.

First hour	\$220.00
Each subsequent one-half hour	\$110.00

(c) Medical Surveillance Program: Individuals shall not be charged for examinations, procedures or immunizations which are required by the Kwajalein Hospital Medical Surveillance Program. Charges shall be non-reimbursable for LSC and SLES employees or shall be directed to the employer for non-LSC employees.

Civilian employees of the U.S. Army shall not be personally charged for Occupational and Preventive Medicine services required by the employee's department or the USAKA/KMR Hospital Occupational Medicine Medical Surveillance Program. Charges shall be directed to Tripler Army Medical Center accompanied by a letter of verification from the USAKA/KMR Medical/Dental evaluator.

(d) Workers' Compensation Injury/Illness: Individuals shall not be personally charged for medical/dental services when the employer provides written authorization (Department of Labor Form L.S 1 or similar form) to give service compensable under Workers' Compensation programs. With appropriate authorization the employer or employers Workers' Compensation insurance shall be charged for care.

Individuals who provide no authorization (within a maximum of 30 days of service) shall be personally charged for medical/dental services.

(e) Examinations required by LSC or USAKA/KMR Safety Officer: Individuals shall not be charged for physical examinations, tests, and procedures done at the request of the LSC or USAKA/KMR Safety Officer charges shall be non-reimbursable for LSC employees or shall be directed to the employer for non-LSC employees.

(f) Off-site consultations and tests: Patients receiving care on a reimbursable basis shall be charged the cost of off-site consultations and tests.

(g) Visiting Specialists:

TAMC Consultants. Active duty military personnel and dependents and retired military personnel and dependents shall not be charged for services. All other individuals shall be charged for office consultations. Services shall be charged in accordance with the Table of Fees maintained by the

USAKA/KMR Medical/Dental facilities.

Civilian Consultants. Unless otherwise specified in civilian consultant subcontracts, individuals shall be billed directly by the consultant for services.

An exception is active duty military and active duty reserve personnel. Unless otherwise specified, the LSC shall be billed by the consultant. The LSC will then send a bill to Tripler Army Medical Center accompanied by a letter of verification from the USAKA/KMR Medical/Dental evaluator.

Civilian Optometrist. Active duty military personnel and active duty reserve personnel shall be billed directly by the optometrist and held personally accountable for glasses ordered from the optometrist. Otherwise, optical examinations shall be billed as for other civilian consultants above.

(4) Optometrist Care:

-Deleted-

(5) Orthodontic Care

(a) An orthodontist visits Kwajalein a minimum of nine times each year. Treatment costs are determined on an individual case basis and are payable directly to the orthodontist, except as noted in b(4) below. In addition to the orthodontist's direct charge, there is a \$5.00 charge for supportive services provided by the LSC that is payable by the individual except as noted in b(4) below.

(b) Orthodontic treatment for active duty military personnel and their dependents and payment for such treatment shall be as follows:

(1) Active duty military personnel and their adult or minor dependents who enter USAKA/KMR fully banded or undergoing an active phase of orthodontic care may receive treatment by the visiting orthodontist on a non-reimbursable basis. Continuity treatment of military personnel and their dependents shall be provided on a space available basis, as determined by the USAKA/KMR Chief Dental Officer, but shall have priority over the initiation of new patient treatment from any source within USAKA/KMR.

(2) Elective orthodontic appliances will not be placed and active orthodontic treatment will not be initiated on active duty military personnel by the visiting orthodontist. In extreme situations where maxillofacial trauma, congenital, developmental or acquired facial deformities, or oral disease has effected the health of the soldier, orthodontic treatment may be initiated, as recommended by the USAKA/KMR Chief Dental Officer and approved by the Army Dental Clinic, Tripler Army Medical Center.

(3) Orthodontic treatment of military dependents may be initiated on a space available basis using the following Handicapping Index of Malocclusion (HIM) as a guide to determine the severity of malocclusion:

Handicapping Malocclusion	40 or more points
Severe Malocclusion	30-39 points
Moderate Malocclusion	20-29 points
Minimal Malocclusion	19 or less points

No minimal or moderate malocclusion cases will be initiated for military dependents as long as a waiting list of severe or handicapping malocclusion cases exists from any source within USAKA/KMR, as determined by the USAKA/KMR Chief Dental Officer.

(4) Charges for LSC orthodontic service pursuant to paragraph (a) above, and orthodontic treatment costs, pursuant to paragraph b(1) through b(3) above, shall be on a non-reimbursable basis to active duty military personnel and their dependents IAW AR 40-3 and current policy of the Army Dental Corps. The orthodontist may be paid by the LSC using base support funds at the end of each subcontract period for orthodontic treatment of military personnel and their dependents. However, such payment shall not result in the minimum earned fee for the period, as set forth in the orthodontist subcontract, being exceeded. Further, such payment shall in no circumstances exceed the cost of round-trip transportation and per-diem to Tripler Army Medical Center for each adult patient and for each minor patient plus one accompanying adult.

FINANCIAL POLICY AND RATE MANUAL

CHAPTER 3

3-1. GENERAL. This chapter defines the policy to comply with DoDD 3200.11, Major Range and Test Facility Base (MRTFB) for applying logistic support cost to customer programs. This includes those ancillary variable indirect costs that benefit customer programs. It provides the procedures for allocating these costs to each contractor and to each customer program. It describes how the additional costs for other government agencies and non-government customers are derived and applied.

3-2. POLICY. The Policy for Implementation is as follows:

a. When available, standard rates will be used to establish a price for services performed by the LSC. For MRTFB customers, procedures covered under paragraph 3-3 will be followed. For non-MRTFB customers, the logistic contractor will use standard rates when available. When not available, direct labor will be loaded by a rate developed according to instructions in paragraph 3-3.

b. Logistic Contractor's Indirect Cost: The logistic contractor's indirect cost will consist of Fee, G&A, Fringe and Management. The rates for these factors will come from the CDRL AP06 report. The rates will be applied by the logistic contractor to all direct labor dollars charged to logistic contractor's customers.

c. Logistic Contractor's Customer Support Cost: The logistic contractor's customer support cost will consist of Education, Medical, Food Services, Facilities Support, Transportation, Other Community Services and Other Support as applicable. These costs will be taken from the CDRL AP06 report. They will be applied in accordance with paragraph 3-3.

d. All contractors will include actual direct and indirect costs incurred in their Memorandum Billing Reports. This will include an applicable share of CONUS cost. Each contractors cost accounting system will prorate to customer programs indirect cost, including G&A and Fee, across a direct labor base. Each contractor will bill only costs incurred by them. All Contractors will also include USAKA/KMR loaded costs on their Memorandum Billing Report showing the load cost as a separate entry.

3-3. PROCEDURES. The USAKA/KMR, SMDC-AC-K-SR and all USAKA/KMR Contractors, to include MIT/LL, shall comply with these procedures.

a. Kwajalein Missile Range (KMR):

(1) Cost Estimates For the Budget Year: As required, the KMR will obtain requirements data from MRTFB customers. The KMR will provide this data to USAKA/KMR logistic support and technical contractors who will respond with estimated labor, material and other costs to support each customer mission. The contractor responses will be forwarded to USAKA/KMR (SMDC-AC-K-SR) to be used to develop contractor percentages.

(2) Revisions During Current Year: Information regarding changes in mission requirements will be provided by the KMR to all contractors. The contractor will review for any updates required and respond with changes in estimates.

b. USAKA/KMR, SMDC-AC-K-SR:

(1) Budget Year Cost Estimates: The SMDC-AC-K-SR will receive from the KMR the direct labor dollars EAC, and the total cost EAC, by program, by contractor, including the logistic contractor. They will use these dollars to develop percentages and provide the percentages to the logistic support contractor for allocation of support costs.

(2) Current Year Cost Estimates: During the current year there will be the normal monthly cost updates and revised EAC's. There may also be updates based on directed changes, i.e., mission cancellations, etc.

(3) On an annual basis, compute the percentage of customer budget year obligations in each contract to the total budget year obligations by contract. This provides the percent share of the total support cost that should go to the customer programs. The balance will be absorbed by the institutional program. This percentage will be provided to the logistic support contractor for allocation of cost to each contractor's customer program. NOTE: The first allocation of logistic support cost is to each contractor for education based on students in school, food service based on bachelors eating in the mess hall; and medical, facilities support, transportation and other community services based on population. The total support cost allocated to each contractor must then be prorated between customer and institutional.

c. Technical Contractor:

(1) Cost Estimate for Budget Year: Each contractor will include in their estimate for each program and the total contract, the direct labor hours and total costs resulting from

their projections. It is requested that the data be provided to the KMR, along with other cost data, e.g., mission cost.

d. Logistic Contractor:

(1) Cost Estimate for Budget Year and Current Year: The logistic contractor will develop CDRL AP06 in accordance with instructions. Cumulative indirect cost (Fee, G&A, Fringe and management) developed under CDRL AP06 will be applied to the logistic contractor's direct labor cost when developing cost for direct support to customers. Cumulative support cost (allocable, i.e., Education, Medical, Food Service, Facilities Support, Transportation, Other Community Services, Other Support) developed under CDRL AP06 will be allocated to each customer. The indirect cost application will be done at the time the direct effort is costed. The support cost distribution will be accomplished in the following steps:

STEP 1. Compute support cost allocable for the budget fiscal year. This will be done for Education, Medical, Food Services, Facilities Support Division, Transportation, Other Community Services, and Other Support. The cost allocable amounts will be the annual amounts projected for each allocable.

STEP 2. Compute percent of distribution of support cost allocable to use for each contractor. The method of determining the percent is shown below for each allocable area.

SUPPORT COST ALLOCABLE	METHOD
Education Services	Student days by Contractor
Food Services	Bachelors by Contractor
Medical Services	Population by Contractor
Facility Engineering Svc	Population by Contractor
Other Community Svc	Population by Contractor
Transportation	Population by Contractor
Other Spt as applicable	Population by Contractor

Data for student days, bachelors, and population will be collected for all MRTFB contractors and for all tenants and government personnel living on the range. A percent is computed for each of the 3 methods, for each contractor and "all others" by dividing the data for each contractor/all others by the total for the specific method. "ALL OTHERS" equals Government civilians, military, Corp of Engineers and their contractors, other non-MRTFB contractors, and any others living on leased ground that are not previously included. Data should be taken from the LSC monthly status report. Total for students will be all students in school. Total for Messing is the number of bachelors eating in the mess hall that work for the MRTFB contractors. Total for population is the number of people living at USAKA/KMR excluding transients and test customers on site.

STEP 3. Compute percent of customer effort to total effort. This is done by dividing the customer funds in the contract by the total contract value for each applicable fiscal year. This percentage will be computed annually by USAKA/KMR (SMDC-AC-K-SR) and provided to the LSC.

STEP 4. Distribute allocable costs from Step 1 to each contract/all others based on percentage ratios computed in Step 2.

STEP 5. Using the ratios computed in Step 3, compute the dollars that should be allocated to all customers for each contractor. Multiply total dollars for each contractor computed in Step 4 by the factor computed in Step 3. This will provide the total dollars, projected for the fiscal year.

STEP 6. After the allocation in Step 5 is made, the load factor must be developed. The logistic contractor will provide CDRL AP06 to USAKA/KMR (SMDC-AC-K-SR and SMDC-AC-K-CR). The USAKA/KMR (SMDC-AC-K-SR) will take each contractor's direct labor dollars and divide those dollars by the allocation amounts calculated in Step 5. The resulting percentages will be the budget year's load factors to be applied to each contractor's direct labor dollars. The load factor for materials will also be taken from the CDRL AP06.

STEP 7. Each contractor will apply the load factors developed in

Step 6. All contractors except the LSC contractor will report the loaded portion for labor and materials on their respective Memorandum Billing Reports. The LSC contractor will report their loaded portion for labor and materials on line 2 of the Memorandum Billing Report for each customer program.

STEP 8. The USAKA/KMR (SMDC-AC-K-SR) will combine all of the loaded amounts for each customer program from each contractor into a single amount for each customer and furnish this amount to the LSC contractor for inclusion on their Memorandum Billing Report.

(2) In order for the logistic contractor to bill for the support cost, the funds for the support will have to be obligated in their contract. This will be done at the beginning of each fiscal year based on the budget year estimates that are developed in the previous fiscal year.

(3) Non-MRTFB Customer Logistic Services Rate: Where a standard rate does not exist, a rate will be computed based on the applicable direct labor rate, plus an amount to cover indirect cost, plus an amount to cover the LSC contractor's support cost. This will be taken from CDRL AP06. The indirect rate will be the total percentage for Fee, G&A, Management Pool and Fringes. The support standard rate will be computed by taking the total allocated cost for the LSC contractor (Step 4)

and dividing the amount by the Range User labor Base as shown on the CDRL AP06 report.

SECTION TABLE OF CONTENTS

DIVISION 03 - CONCRETE

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 QUALIFICATIONS
- 1.4 FIELD TEST PANELS
 - 1.4.1 Sample Wall Panels
 - 1.4.2 Slab Panels
- 1.5 SPECIAL REQUIREMENTS
- 1.6 GENERAL REQUIREMENTS
 - 1.6.1 Tolerances
 - 1.6.1.1 Floors
 - 1.6.1.2 Floors by the F-Number System
 - 1.6.2 Strength Requirements and w/c Ratio
 - 1.6.2.1 Strength Requirements**
 - 1.6.2.2 Water-Cement Ratio
 - 1.6.3 Air Entrainment
 - 1.6.4 Slump
 - 1.6.5 Concrete Temperature
 - 1.6.6 Size of Coarse Aggregate
 - 1.6.7 Special Properties and Products
- 1.7 MIXTURE PROPORTIONS
 - 1.7.1 Proportioning Studies for Normal Weight Concrete
 - 1.7.2 Average Compressive Strength Required for Mixtures
 - 1.7.2.1 Computations from Test Records
 - 1.7.2.2 Computations without Previous Test Records
 - 1.7.3 Mix Design for Topping for Refrigeration and Freezer Floors
- 1.8 STORAGE OF MATERIALS
- 1.9 GOVERNMENT ASSURANCE INSPECTION AND TESTING
 - 1.9.1 Materials
 - 1.9.2 Fresh Concrete
 - 1.9.3 Hardened Concrete
 - 1.9.4 Inspection

PART 2 PRODUCTS

- 2.1 CEMENTITIOUS MATERIALS
 - 2.1.1 Portland Cement
 - 2.1.2 High-Early-Strength Portland Cement
- 2.2 AGGREGATES
 - 2.2.1 Fine Aggregate
 - 2.2.2 Coarse Aggregate
 - 2.2.3 Materials for Topping for Refrigeration and Freezer Floors
- 2.3 CHEMICAL ADMIXTURES
 - 2.3.1 Air-Entraining Admixture
 - 2.3.2 Accelerating Admixture

- 2.3.3 Water-Reducing or Retarding Admixture
- 2.3.4 High-Range Water Reducer
- 2.3.5 Other Chemical Admixtures
- 2.4 CURING MATERIALS
 - 2.4.1 Impervious-Sheet
 - 2.4.2 Membrane-Forming Compound
 - 2.4.3 Burlap and Cotton Mat
- 2.5 WATER
- 2.6 NONSHRINK GROUT
- 2.7 NONSLIP SURFACING MATERIAL
- 2.8 LATEX BONDING AGENT
- 2.9 EPOXY RESIN
- 2.10 EMBEDDED ITEMS
- 2.11 FLOOR HARDENER
- 2.12 PERIMETER INSULATION
- 2.13 VAPOR BARRIER
- 2.14 JOINT MATERIALS
 - 2.14.1 Joint Fillers and Sealers
 - 2.14.2 Contraction Joints in Slabs

PART 3 EXECUTION

- 3.1 PREPARATION FOR PLACING
 - 3.1.1 Foundations
 - 3.1.1.1 Concrete on Earth Foundations
 - 3.1.2 Previously Placed Concrete
 - 3.1.2.1 Preparation of Previously Placed Concrete
 - 3.1.3 Vapor Barrier
 - 3.1.4 Perimeter Insulation
 - 3.1.5 Embedded Items
- 3.2 CONCRETE PRODUCTION
 - 3.2.1 Batching, Mixing, and Transporting Concrete
 - 3.2.1.1 General
 - 3.2.1.2 Batching Equipment
 - 3.2.1.3 Scales
 - 3.2.1.4 Batching Tolerances
 - 3.2.1.5 Moisture Control
 - 3.2.1.6 Concrete Mixers
 - 3.2.1.7 Stationary Mixers
 - 3.2.1.8 Truck Mixers
- 3.3 TRANSPORTING CONCRETE TO PROJECT SITE
- 3.4 CONVEYING CONCRETE ON SITE
 - 3.4.1 Buckets
 - 3.4.2 Transfer Hoppers
 - 3.4.3 Trucks
 - 3.4.4 Chutes
 - 3.4.5 Belt Conveyors
 - 3.4.6 Concrete Pumps
- 3.5 PLACING CONCRETE
 - 3.5.1 Depositing Concrete
 - 3.5.2 Consolidation
 - 3.5.3 Hot Weather Requirements
 - 3.5.4 Prevention of Plastic Shrinkage Cracking
 - 3.5.5 Placing Concrete in Congested Areas
 - 3.5.6 Placing Flowable Concrete
- 3.6 JOINTS
 - 3.6.1 Construction Joints
 - 3.6.2 Contraction Joints in Slabs on Grade
 - 3.6.3 Dowels and Tie Bars

- 3.7 FINISHING FORMED SURFACES
 - 3.7.1 Class A Finish
 - 3.7.2 Class C and Class D Finish
- 3.8 REPAIRS
 - 3.8.1 Damp-Pack Mortar Repair
 - 3.8.2 Repair of Major Defects
 - 3.8.2.1 Surface Application of Mortar Repair
 - 3.8.3 Resinous and Latex Material Repair
- 3.9 FINISHING UNFORMED SURFACES
 - 3.9.1 General
 - 3.9.2 Rough Slab Finish
 - 3.9.3 Floated Finish
 - 3.9.4 Troweled Finish
 - 3.9.5 Non-Slip Finish
 - 3.9.5.1 Broomed
 - 3.9.6 Heavy Duty Floors
 - 3.9.6.1 General
 - 3.9.6.2 Placing and Finishing
 - 3.9.6.3 Curing and Protection
- 3.10 FLOOR HARDENER
- 3.11 EXTERIOR SLAB AND RELATED ITEMS
 - 3.11.1 Pavements
 - 3.11.2 Sidewalks
 - 3.11.3 Curbs and Gutters
 - 3.11.4 Pits and Trenches
- 3.12 CURING AND PROTECTION
 - 3.12.1 General
 - 3.12.2 Moist Curing
 - 3.12.3 Membrane Forming Curing Compounds
 - 3.12.4 Impervious Sheeting
 - 3.12.5 Ponding or Immersion
- 3.13 SETTING BASE PLATES AND BEARING PLATES
 - 3.13.1 Damp-Pack Bedding Mortar
 - 3.13.2 Nonshrink Grout
 - 3.13.2.1 Mixing and Placing of Nonshrink Grout
 - 3.13.2.2 Treatment of Exposed Surfaces
- 3.14 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL
 - 3.14.1 Grading and Corrective Action
 - 3.14.1.1 Fine Aggregate
 - 3.14.1.2 Coarse Aggregate
 - 3.14.2 Quality of Aggregates
 - 3.14.3 Scales, Batching and Recording
 - 3.14.4 Batch-Plant Control
 - 3.14.5 Concrete Mixture
 - 3.14.6 Inspection Before Placing
 - 3.14.7 Placing
 - 3.14.8 Vibrators
 - 3.14.9 Curing Inspection
 - 3.14.10 Mixer Uniformity
 - 3.14.11 Reports

-- End of Section Table of Contents --

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214.3R	(1988) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 305R	(1991) Hot Weather Concreting
ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(1991; R 1996) Burlap Cloth Made From Jute or Kenaf
--------------	---

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31/C 31M	(1998) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1999a) Concrete Aggregates
ASTM C 39	(1996) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42	(1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 78	(1994) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
ASTM C 94	(1999) Ready-Mixed Concrete

ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143	(1998) Slump of Hydraulic Cement Concrete
ASTM C 150	(1998a) Portland Cement
ASTM C 171	(1997a) Sheet Materials for Curing Concrete
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 173	(1994a) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 192/C 192M	(1998) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997e) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1998) Air-Entraining Admixtures for Concrete
ASTM C 309	(1998a) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	(1999) Chemical Admixtures for Concrete
ASTM C 552	(1991) Cellular Glass Thermal Insulation
ASTM C 578	(1995) Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 591	(1994) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 1017	(1998) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1059	(1999) Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C 1064/C 1064M	(1999) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ASTM C 1107	(1999) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D 638	(2000) Test Method for Tensile Properties of Plastics
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM E 96	(1995) Water Vapor Transmission of Materials
ASTM E 154	(1999) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
ASTM E 1155M	(1996) Determine Floor Flatness and Levelness Using the F-Number System (Metric)
ASTM E 1745	(1997) Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

CORPS OF ENGINEERS (COE)

COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete
COE CRD-C 540	(1971; R 1981) Standard Specification for Nonbituminous Inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sawable Type
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(1997) NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices
------------	--

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1996) Concrete Plant Standards
----------------	---------------------------------

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Mixture Proportions; G, RE

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of each strength or class of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

SD-06 Test Reports

Testing and Inspection for Contractor Quality Control; G, RE

Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, aggregate, admixtures, and curing compound proposed for use on this project.

SD-07 Certificates

Qualifications.

Written documentation for Contractor Quality Control personnel.

1.3 QUALIFICATIONS

Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field Testing Technician, Grade I
Concrete Laboratory Testing Technician, Grade I or II
Concrete Construction Inspector, Level II

Concrete Transportation Construction Inspector or
Reinforced Concrete Special Inspector, Jointly certified by American Concrete Institute (ACI), Building Official and Code Administrators International (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International (SBCCI).

The foreman or lead journeyman of the flatwork finishing crew shall have

similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

1.4 FIELD TEST PANELS

Field test panels shall be constructed prior to beginning of work using the materials and procedures proposed for use on the job, to demonstrate the results to be attained. The quality and appearance of each panel shall be subject to the approval of the Contracting Officer, and, if not judged satisfactory, additional panels shall be constructed until approval is attained. Formed or finished surfaces in the completed structure shall match the quality and appearance of the approved field example.

1.4.1 Sample Wall Panels

One sample panel at least 1220 mm by 1525 mm and 150 mm thick shall be constructed to demonstrate Class A formed finish. Panels shall be located at the pre-casting yard. Each panel shall include a full length and full width joint line and shall have at least two voids each at least 300 mm by 300 mm by 75 mm deep either impressed in the concrete as placed or chipped in the hardened concrete. After the concrete is 7 days old, the voids shall be patched to demonstrate the effectiveness and the appearance of the Contractor's repair procedures.

1.4.2 Slab Panels

A slab panel at least 1220 mm by 1525 mm and 100 mm thick shall be constructed to demonstrate slab finish. Panels shall be located at the pre-casting yard. Each panel shall have a full length joint line.

1.5 SPECIAL REQUIREMENTS

A pre-installation meeting with the Contracting Officer will be required at least 10 days prior to start of construction. The Contractor shall be responsible for calling the meeting; the Project Superintendent and active installation personnel shall be present.

1.6 GENERAL REQUIREMENTS

1.6.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

1.6.1.1 Floors

For the purpose of this Section the following terminology correlation between ACI 117/117R and this Section shall apply:

Floor Profile Quality Classification From ACI 117/117R	This Section
-----	-----
Conventional Bullfloated	Same
Conventional Straightedged	Same

Floor Profile Quality Classification From ACI 117/117R	This Section
-----	-----
Flat	Float Finish or Trowel Finish
Very Flat	Same. Use only with F-system

Levelness tolerance shall not apply where design requires floors to be sloped to drains or sloped for other reasons.

1.6.1.2 Floors by the F-Number System

The flatness and levelness of floors shall be carefully controlled and the tolerances shall be measured by the F-Number system of Paragraph 4.5.6 and 4.5.6.1 of ACI 117/117R. The Contractor shall furnish an approved floor profilograph or other equipment capable of measuring the floor flatness (FF) number and the floor levelness (FL) number in accordance with ASTM E 1155M. The Contractor shall perform the tolerance measurements within 72 hours after floor slab construction while being observed by the Contracting Officer. The tolerances of surfaces beyond the limits of ASTM E 1155M (the areas within 600 mm of embedments and construction joints) shall be acceptable to the Contracting Officer. Tolerances of the following areas shall meet the requirements for the listed surfaces as specified in paragraphs 4.5.6 and 4.5.6.1 of ACI 117/117R.

Trowel Finish-	Areas - all other areas inside the building
Very Flat-	Areas - Refrigerated and Freezer Rooms

1.6.2 Strength Requirements and w/c Ratio

1.6.2.1 Strength Requirements

Specified compressive strength (f'c) shall be as follows:

COMPRESSIVE STRENGTH	STRUCTURE OR PORTION OF STRUCTURE
34.5 MPa at 28 days	Concrete topping over refrigerator and freezer floors
27.5 MPa at 28 days	Foundations, Composite topping over precast double tees, and pavements
20 MPa at 28 days	Curbs, sidewalks and all other concrete.

Concrete slabs on-grade shall have a 28-day flexural strength of 4.5 MPa. Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type II portland cement. Compressive strength shall be determined in accordance with ASTM C 39. Flexural strength shall be determined with ASTM C 78.

- Evaluation of Concrete Compressive Strength. Compressive strength specimens (152 by 305 mm cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39. The strength of the

concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'_c and no individual test result falls below the specified strength f'_c by more than 3.5 MPa. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

- b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 3.5 MPa or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Government.
- c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being understrength shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Contracting Officer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.
- d. Evaluation of Concrete Flexural Strength. Flexural strength specimens (beams) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 78. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified flexural strength and no individual test result falls below the specified flexural strength by more than 350 kPa. A "test" is defined as the average of two companion beams. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the slab is considered potentially deficient.

1.6.2.2 Water-Cement Ratio

Maximum water-cement ratio (w/c) for normal weight concrete shall be as follows:

WATER-CEMENT RATIO, BY WEIGHT	STRUCTURE OR PORTION OF STRUCTURE
0.40	All concrete with compressive strength of 27.5 MPa at 28 days.
0.45	All other concrete

These w/c's may cause higher strengths than that required above for compressive or flexural strength. The maximum w/c required will be the equivalent w/c as determined by conversion from the weight ratio of water to cement by the weight equivalency method as described in ACI 211.1.

1.6.3 Air Entrainment

All normal weight concrete shall be air entrained to contain between 5 and 7 percent total air, except that when the nominal maximum size coarse aggregate is 19 mm or smaller it shall be between 4.5 and 7.5 percent. Specified air content shall be attained at point of placement into the forms. Air content for normal weight concrete shall be determined in accordance with ASTM C 231.

1.6.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143.

Structural Element	Slump	
	Minimum	Maximum
Walls, columns and beams	50 mm	100 mm
Foundation walls, substructure walls, footings, slabs	25 mm	75 mm
Any structural concrete approved for placement by pumping:		
At pump	50 mm	150 mm
At discharge of line	25 mm	100 mm

When use of a plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C 494 is permitted to increase the slump of concrete, concrete shall have a slump of 50 to 100 mm before the admixture is added and a maximum slump of 200 mm at the point of delivery after the admixture is added.

1.6.5 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 32 degrees C.

When the ambient temperature during placing is 5 degrees C or less, or is expected to be at any time within 6 hours after placing, the temperature of the concrete as delivered shall be between 12 and 25 degrees C.

1.6.6 Size of Coarse Aggregate

The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

1.6.7 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

1.7 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, aggregates, water and admixtures as specified.

1.7.1 Proportioning Studies for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Except as specified for flexural strength concrete, mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in subparagraph Water-Cement Ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement by the weight equivalency method as described in ACI 211.1. Laboratory trial mixtures shall be designed for maximum permitted slump and air content. Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192/C 192M. They shall be tested at 7 and 28 days in accordance with ASTM C 39. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and 28 day strengths. Each

mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

1.7.2 Average Compressive Strength Required for Mixtures

The mixture proportions selected during mixture design studies shall produce a required average compressive strength (f'_{cr}) exceeding the specified compressive strength (f'_c) by the amount indicated below. This required average compressive strength, f'_{cr} , will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below f'_{cr} during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day f'_{cr} , the mixture shall be adjusted, as approved, to bring the daily average back up to f'_{cr} . During production, the required f'_{cr} shall be adjusted, as appropriate, based on the standard deviation being attained on the job.

1.7.2.1 Computations from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths (f'_c) within 7 MPa of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength f'_{cr} used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

$$f'_{cr} = f'_c + 1.34S \text{ where units are in MPa}$$

$$f'_{cr} = f'_c + 2.33S - 3.45 \text{ where units are in MPa}$$

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

1.7.2.2 Computations without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f'_{cr} shall be determined as follows:

- a. If the specified compressive strength f'_c is less than 20 MPa,

$$f'_{cr} = f'_c + 6.9 \text{ MPa}$$

- b. If the specified compressive strength f'_c is 20 to 35 MPa,

$$f'_{cr} = f'_c + 8.3 \text{ MPa}$$

1.7.3 Mix Design for Topping for Refrigeration and Freezer Floors

The concrete mix design for bonded topping for heavy duty floors shall contain the greatest practical proportion of coarse aggregate within the specified proportion limits. The mix shall be designed to produce concrete having a 28-day strength of at least 34.5 MPa. Concrete for the topping shall consist of the following proportions, by weight:

1.00 part portland cement
1.15 to 1.25 parts fine aggregate
1.80 to 2.00 parts coarse aggregate

Maximum w/c shall be 0.33. The topping concrete shall not be air-entrained. The concrete shall be mixed so as to produce a mixture of the driest consistency possible to work with a sawing motion of the strike-off and which can be floated and compacted as specified without producing water or excess cement at the surface. In no case shall slump exceed 25 mm as determined by ASTM C 143.

1.8 STORAGE OF MATERIALS

Cement and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months shall not be used unless retested and proven to meet the specified requirements. Materials shall be capable of being accurately identified after bundles or containers are opened.

1.9 GOVERNMENT ASSURANCE INSPECTION AND TESTING

Day-to day inspection and testing shall be the responsibility of the Contractor Quality Control (CQC) staff. However, representatives of the Contracting Officer can and will inspect construction as considered appropriate and will monitor operations of the Contractor's CQC staff. Government inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

1.9.1 Materials

The Government will sample and test aggregates, cementitious materials, other materials, and concrete to determine compliance with the specifications as considered appropriate. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of

batching in accordance with ASTM D 75. Other materials will be sampled from storage at the jobsite or from other locations as considered appropriate. Samples may be placed in storage for later testing when appropriate.

1.9.2 Fresh Concrete

Fresh concrete will be sampled as delivered in accordance with ASTM C 172 and tested in accordance with these specifications, as considered necessary.

1.9.3 Hardened Concrete

Tests on hardened concrete will be performed by the Government when such tests are considered necessary.

1.9.4 Inspection

Concrete operations may be tested and inspected by the Government as the project progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered nor will it obligate the Government for final acceptance.

PART 2 PRODUCTS

The Contractor shall provide and transport an adequate supply of cementitious materials, aggregates and approved chemical admixtures to the job site for providing site-mixed cast-in-place structural concrete as required by the Contract Documents.

2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement, and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

2.1.1 Portland Cement

ASTM C 150, Type II or III with a maximum 8 percent of tricalcium aluminate.

2.1.2 High-Early-Strength Portland Cement

ASTM C 150, Type III with tricalcium aluminate limited to 8 percent.

2.2 AGGREGATES

Aggregates shall conform to the following.

2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33, Class 5S, size designation 67.

2.2.3 Materials for Topping for Refrigeration and Freezer Floors

In addition to the requirements specified above, coarse aggregate used for this purpose shall be a well graded, hard, sound diabase, trap rock, emery, granite or other natural or manufactured aggregate having equivalent hardness and wearing qualities and shall have a percentage of loss not to exceed 30 after 500 revolutions when tested in accordance with ASTM C 131. Gradation of the aggregates when tested in accordance with ASTM C 136 shall be as follows:

Coarse Aggregate

Sieve Size	Cumulative Percent By Weight Passing
19 mm	100
12.5 mm	50-100
9.5 mm	25-50
4.75 mm	0-15
2.36 mm	0-8

Fine Aggregate

Sieve Size	Cumulative Percent By Weight Passing
9.5 mm	100
4.75 mm	95-100
2.36 mm	65-80
1.18 mm	45-65
0.600 mm	25-45
0.300 mm	5-15
0.150 mm	0-5

2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

2.3.1 Air-Entraining Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

2.3.2 Accelerating Admixture

ASTM C 494, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

2.3.3 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

2.3.4 High-Range Water Reducer

ASTM C 494, Type F or G, except that the 6-month and 1-year strength requirements are waived. The admixture shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.3.5 Other Chemical Admixtures

Chemical admixtures for use in producing flowing concrete shall comply with ASTM C 1017, Type I or II. These admixtures shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.4 CURING MATERIALS

2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

2.4.2 Membrane-Forming Compound

Membrane-Forming curing compound shall conform to ASTM C 309, Type 1-D or 2, except that only a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces that are to be painted or are to receive bituminous roofing, or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified. Nonpigmented compound shall contain a fugitive dye, and shall have the reflective requirements in ASTM C 309 waived.

2.4.3 Burlap and Cotton Mat

Burlap and cotton mat used for curing shall conform to AASHTO M 182.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107, Grade A B C, and shall be a commercial formulation suitable for the proposed application.

2.7 NONSLIP SURFACING MATERIAL

Nonslip surfacing material shall consist of 55 percent, minimum, aluminum oxide or silicon-dioxide abrasive ceramically bonded together to form a homogeneous material sufficiently porous to provide a good bond with portland cement paste; or factory-graded emery aggregate consisting of not less than 45 percent aluminum oxide and 25 percent ferric oxide. The aggregate shall be well graded from particles retained on the 0.6 mm sieve to particles passing the 2.36 mm sieve.

2.8 LATEX BONDING AGENT

Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

2.9 EPOXY RESIN

Epoxy resins for use in repairs shall conform to ASTM C 881, Type V, Grade 2. Class as appropriate to the existing ambient and surface temperatures.

2.10 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application. Dovetail slots shall be galvanized steel. Hangers for suspended ceilings shall be as specified in Section 09510 ACOUSTICAL CEILINGS. Inserts for shelf angles and bolt hangers shall be of malleable iron or cast or wrought steel.

2.11 FLOOR HARDENER

Floor hardener shall be a colorless aqueous solution containing zinc silicofluoride, magnesium silicofluoride, or sodium silicofluoride. These silicofluorides can be used individually or in combination. Proprietary hardeners may be used if approved in writing by the Contracting Officer.

2.12 PERIMETER INSULATION

Perimeter insulation shall be polystyrene conforming to ASTM C 578, Type II; polyurethane conforming to ASTM C 591, Type II; or cellular glass conforming to ASTM C 552, Type I or IV.

2.13 VAPOR BARRIER

Vapor barrier shall be of the following properties:

- a. Minimum 15-mil thick polyolefin geomembrane manufactured with ISO certified virgin resins.
- b. Water Vapor Retarder ASTM E 1745 meets Class B Water Vapor Transmission Rate ASTM E 96 not exceeding 0.006 gr./ft²/hr.
- c. Permeance Rating ASTM E 96 not exceeding 0.015 gr./ft²/hr.
- d. Puncture Resistance ASTM E 154 minimum 1970 grams.
- e. Tensile Strength ASTM D 638 minimum 45lbf/in.
 - 1) Installation shall be in accordance manufacturer's instructions including taping procedures at the laps, tape material used, patching procedures, and installation at vertical walls.
 - 2) No penetration of the vapor barrier, except as required at permanent utilities penetrations, shall be allowed.
 - 3) The vapor barrier shall not be left exposed to ultraviolet rays for more than a day either in storage or prior to pouring of the concrete slab.

2.14 JOINT MATERIALS

2.14.1 Joint Fillers and Sealers

Expansion joint fillers shall be preformed materials conforming to ASTM D 1751. Joint Sealants shall be as specified in Section SECTION 03151 EXPANSION, CONTRACTION AND CONSTRUCTION JOINTS IN CONCRETE FOR CIVIL WORKS.

2.14.2 Contraction Joints in Slabs

Sawable type contraction joint inserts shall conform to COE CRD-C 540. Nonsawable joint inserts shall have sufficient stiffness to permit placement in plastic concrete without undue deviation from a straight line and shall conform to the physical requirements of COE CRD-C 540, with the exception of Section 3.4 "Resistance to Sawing". Plastic inserts shall be polyvinyl chloride conforming to the materials requirements of COE CRD-C 572.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100 STRUCTURAL CONCRETE FORMWORK. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200 CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Foundations

3.1.1.1 Concrete on Earth Foundations

Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.

3.1.2 Previously Placed Concrete

3.1.2.1 Preparation of Previously Placed Concrete

Concrete surfaces to which other concrete is to be bonded shall be abraded in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Surfaces shall be thoroughly washed and shall be moist but without free water for at least 12 hours before concrete is placed.

3.1.3 Vapor Barrier

Vapor barrier shall be provided beneath the interior on-grade concrete floor slabs. The greatest widths and lengths practicable shall be used to eliminate joints wherever possible. Joints shall be lapped a minimum of 300 mm. Torn, punctured, or damaged vapor barrier material shall be removed and new vapor barrier shall be provided prior to placing concrete. For minor repairs, patches may be made using laps of at least 300 mm. Lapped joints shall be sealed and edges patched with pressure-sensitive adhesive or tape not less than 50 mm wide and compatible with the membrane. Vapor barrier shall be placed directly on underlying subgrade, base course, or capillary water barrier, unless it consists of crushed material or large granular material which could puncture the vapor barrier.

In this case, the surface shall be choked with a light layer of sand, as approved, before placing the vapor barrier. A 50 mm layer of compacted, clean concrete sand (fine aggregate) shall be placed on top of the vapor barrier before placing concrete. Concrete placement shall be controlled so as to prevent damage to the vapor barrier, or any covering sand.

3.1.4 Perimeter Insulation

Perimeter insulation shall be installed at locations indicated. Adhesive shall be used where insulation is applied to the interior surface of foundation walls and may be used for exterior application.

3.1.5 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding shall not be performed on embedded metals within 300 mm of the surface of the concrete.

Tack welding shall not be performed on or to embedded items.

3.2 CONCRETE PRODUCTION

3.2.1 Batching, Mixing, and Transporting Concrete

Concrete shall be batched and mixed on site. Concrete shall be batched and mixed onsite or close to onsite; and shall conform to the following subparagraphs.

3.2.1.1 General

The batching plant shall be located on site in the general area indicated on the drawings. The batching, mixing and placing system shall have a capacity of at least 24 cubic meters per hour. The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

3.2.1.2 Batching Equipment

The batching controls shall be semiautomatic or automatic, as defined in NRMCA CPMB 100. A semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system

shall be equipped with accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. The weight of water and admixtures shall be recorded if batched by weight. Separate bins or compartments shall be provided for each size group of aggregate and type of cementitious material, to prevent intermingling at any time. Aggregates shall be weighed either in separate weigh batchers with individual scales or, provided the smallest size is batched first, cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cementitious material. If both portland cement and other cementitious material are used, they may be batched cumulatively, provided that the portland cement is batched first. Water may be measured by weight or volume. Water shall not be weighed or measured cumulatively with another ingredient. Filling and discharging valves for the water metering or batching system shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. Piping for water and for admixtures shall be free from leaks and shall be properly valved to prevent backflow or siphoning. Admixtures shall be furnished as a liquid of suitable concentration for easy control of dispensing. An adjustable, accurate, mechanical device for measuring and dispensing each admixture shall be provided. Each admixture dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and individually discharged automatically in a manner to obtain uniform distribution throughout the water as it is added to the batch in the specified mixing period. When use of truck mixers makes this requirement impractical, the admixture dispensers shall be interlocked with the sand batchers. Different admixtures shall not be combined prior to introduction in water and shall not be allowed to intermingle until in contact with the cement. Admixture dispensers shall have suitable devices to detect and indicate flow during dispensing or have a means for visual observation. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment, and for sampling and calibrating the dispensing of cementitious material, water, and admixtures. Filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

3.2.1.3 Scales

The weighing equipment shall conform to the applicable requirements of CPMB Concrete Plant Standard, and of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. The tests shall be made at the specified frequency in the presence of a Government inspector. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

3.2.1.4 Batching Tolerances

(A) Tolerances with Weighing Equipment

MATERIAL	PERCENT OF REQUIRED WEIGHT
Cementitious materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1

MATERIAL	PERCENT OF REQUIRED WEIGHT
Chemical admixture	0 to plus 6

(B) Tolerances with Volumetric Equipment

For volumetric batching equipment used for water and admixtures, the following tolerances shall apply to the required volume of material being batched:

MATERIAL	PERCENT OF REQUIRED MATERIAL
Water:	plus or minus 1 percent
Chemical admixtures:	0 to plus 6 percent

3.2.1.5 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the weights of the materials being batched.

3.2.1.6 Concrete Mixers

Mixers shall be stationary mixers or truck mixers. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

3.2.1.7 Stationary Mixers

Concrete plant mixers shall be drum-type mixers of tilting, nontilting, horizontal-shaft, or vertical-shaft type, or shall be pug mill type and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time and uniformity shall conform to all the requirements in ASTM C 94 applicable to central-mixed concrete.

3.2.1.8 Truck Mixers

Truck mixers, the mixing of concrete therein, and concrete uniformity shall conform to the requirements of ASTM C 94. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it is possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed. Water shall not be added at the placing site unless specifically approved; and in no case shall it exceed the specified w/c. Any such water shall be injected at the base of the mixer, not at the discharge end.

3.3 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in truck mixers, or by approved pumping equipment.

3.4 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

3.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 0.2 square meters. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 1.5 cubic meters shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

3.4.2 Transfer Hoppers

Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and shall have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

3.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Nonagitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

3.4.5 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means, such as discharge baffle or hopper, for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 900 mm. The belt speed shall be a minimum of 90 meters per minute and a maximum of

225 meters per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant truck that is long enough to extend through the reinforcing bars.

3.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 100 mm. Aluminum pipe shall not be used.

3.5 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 30 degrees C, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.5.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 1.5 meters except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 300 mm thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 100 mm thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly

consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.6 mm, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 150 mm into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 100 mm and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segregation or flotation of coarse aggregate shall be prevented. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

3.5.3 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 30 degrees C, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064M. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 49 degrees C. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	33 C
40-60	30 C
Less than 40	27 C

3.5.4 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog

sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.5.5 Placing Concrete in Congested Areas

Special care shall be used to ensure complete filling of the forms, elimination of all voids, and complete consolidation of the concrete when placing concrete in areas congested with reinforcing bars, embedded items, waterstops and other tight spacing. An appropriate concrete mixture shall be used, and the nominal maximum size of aggregate (NMSA) shall meet the specified criteria when evaluated for the congested area. Vibrators with heads of a size appropriate for the clearances available shall be used, and the consolidation operation shall be closely supervised to ensure complete and thorough consolidation at all points. Where necessary, splices of reinforcing bars shall be alternated to reduce congestion. Where two mats of closely spaced reinforcing are required, the bars in each mat shall be placed in matching alignment to reduce congestion. Reinforcing bars may be temporarily crowded to one side during concrete placement provided they are returned to exact required location before concrete placement and consolidation are completed.

3.5.6 Placing Flowable Concrete

If a plasticizing admixture conforming to ASTM C 1017 is used or if a Type F or G high range water reducing admixture is permitted to increase the slump, the concrete shall meet all requirements of paragraph GENERAL REQUIREMENTS in PART 1. Extreme care shall be used in conveying and placing the concrete to avoid segregation. Consolidation and finishing shall meet all requirements of paragraphs Placing Concrete, Finishing Formed Surfaces, and Finishing Unformed Surfaces. No relaxation of requirements to accommodate flowable concrete will be permitted.

3.6 JOINTS

Joints shall be located and constructed as indicated or approved. Joints not indicated on the drawings shall be located and constructed to minimize the impact on the strength of the structure. In general, such joints shall be located near the middle of the spans of supported slabs, beams, and girders unless a beam intersects a girder at this point, in which case the joint in the girder shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and at the tops of footings or floor slabs, unless otherwise approved. Joints shall be perpendicular to the main reinforcement. All reinforcement shall be continued across joints; except that reinforcement or other fixed metal items shall not be continuous through expansion joints, or through construction or contraction joints in slabs on grade. Reinforcement shall be 50 mm clear from each joint. Except where otherwise indicated, construction joints between interior slabs on grade and vertical surfaces shall consist of 1.5 kg per square meter asphalt-saturated felt, extending for the full depth of the slab. The perimeters of the slabs shall be free of fins, rough edges, spalling, or other unsightly appearance. Reservoir for sealant for construction and contraction joints in slabs shall be formed to the dimensions shown on the drawings by removing snap-out joint-forming inserts, by sawing sawable inserts, or by sawing to widen the top portion of sawed joints. Joints to be sealed shall be cleaned and sealed as indicated and in accordance with Section 07900 JOINT SEALING.

3.6.1 Construction Joints

For concrete other than slabs on grade, construction joints shall be located so that the unit of operation does not exceed 7.5 meters. Concrete shall be placed continuously so that each unit is monolithic in construction. Fresh concrete shall not be placed against adjacent hardened concrete until it is at least 24 hours old. Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete begins to lose its plasticity, before placing concrete for beams, girders, or slabs thereon. In walls having door or window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints in walls or columns are required, a strip of 25 mm square-edge lumber, bevelled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 25 mm above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph Previously Placed Concrete.

3.6.2 Contraction Joints in Slabs on Grade

Contraction joints shall be located and detailed as shown on the drawings. Contraction Joints shall be produced by forming a weakened plane in the concrete slab by sawing a continuous slot with a concrete saw. Regardless of method used to produce the weakened plane, it shall be 1/4 the depth of the slab thickness and between 3 and 5 mm wide. For saw-cut joints, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent ravelling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Reservoir for joint sealant shall be formed as previously specified.

3.6.3 Dowels and Tie Bars

Dowels and tie bars shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200 CONCRETE REINFORCEMENT and herein. Conventional smooth "paving" dowels shall be installed in slabs using approved methods to hold the dowel in place during concreting within a maximum alignment tolerance of 1 mm in 100 mm. "Structural" type deformed bar dowels, or tie bars, shall be installed to meet the specified tolerances. Care shall be taken during placing adjacent to and around dowels and tie bars to ensure there is no displacement of the dowel or tie bar and that the concrete completely embeds the dowel or tie bar and is thoroughly consolidated.

3.7 FINISHING FORMED SURFACES

Forms, form materials, and form construction are specified in Section 03100 STRUCTURAL CONCRETE FORMWORK. Finishing of formed surfaces shall be as

specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas at the completion of the contract and, for Class A, shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

3.7.1 Class A Finish

Class A finish is required at all exposed surfaces unless noted otherwise. Fins, ravelings, and loose material shall be removed, all surface defects over 12 mm in diameter or more than 12 mm deep, shall be repaired and, except as otherwise indicated or as specified in Section 03100 STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Defects more than 12 mm in diameter shall be cut back to sound concrete, but in all cases at least 25 mm deep. The Contractor shall prepare a sample panel for approval (as specified in PART 1) before commencing repair, showing that the surface texture and color match will be attained. Metal tools shall not be used to finish repairs in Class A surfaces.

3.7.2 Class C and Class D Finish

Class C finish is required at all concealed surfaces and interior surfaces of the mechanical and electrical rooms. Class D finish is required at foundation surfaces against which backfill will be placed. Fins, ravelings, and loose material shall be removed, and, except as otherwise indicated or as specified in Section 03100 STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Honeycomb and other defects more than 12 mm deep or more than 50 mm in diameter shall be repaired. Defects more than 50 mm in diameter shall be cut back to sound concrete, but in all cases at least 25 mm deep.

3.8 REPAIRS

3.8.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 100 mm shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other

similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part portland cement to 2 parts fine aggregate passing the 1.18 mm sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

3.8.2 Repair of Major Defects

Major defects will be considered to be those more than 12 mm deep or, for Class A and B finishes, more than 12 mm in diameter and, for Class C and D finishes, more than 50 mm in diameter. Also included are any defects of any kind whose depth is over 100 mm or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

3.8.2.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 50 mm on all sides. All such defective areas greater than 7800 square mm shall be outlined by saw cuts at least 25 mm deep. Defective areas less than 7800 square mm shall be outlined by a 25 mm deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Contracting Officer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with

polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

3.8.3 Resinous and Latex Material Repair

In lieu of the portland cement bonding coats specified above, an epoxy resin or a latex bonding agent may be used.

3.9 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

3.9.1 General

The ambient temperature of spaces adjacent to unformed surfaces being finished and of the base on which concrete will be placed shall be not less than 10 degrees C. In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage, as directed. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

3.9.2 Rough Slab Finish

As a first finishing operation for unformed surfaces and as final finish receive a rough slab finish prepared as follows. Areas indicated on the drawings shall receive only a rough slab finish. The concrete shall be uniformly placed across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails. Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

3.9.3 Floated Finish

Slabs to receive more than a rough slab finish shall next be given a wood float finish. Roof surfaces shall be given only a float finish. The screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. Then, after the concrete has stiffened so that it will withstand a man's weight without imprint of more than 6 mm and the water sheen has disappeared, it shall be floated to a true and even plane free of ridges. Floating shall be performed by use of suitable hand floats or power driven equipment. Sufficient pressure shall be used on the floats to bring a film of moisture to the surface. Hand floats shall be made of wood, magnesium, or aluminum. Concrete that exhibits stickiness shall be floated with a magnesium float. Care shall be taken to prevent over-finishing or incorporating water into the surface.

3.9.4 Troweled Finish

All interior floors, except where indicated otherwise, shall be given a trowel finish. After floating is complete and after the surface moisture has disappeared, unformed surfaces shall be steel-troweled to a smooth, even, dense finish, free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. Additional trowelings shall be performed, either by hand or machine until the surface has been troweled 2 times, with waiting period between each. Care shall be taken to prevent blistering and if such occurs, troweling shall immediately be stopped and operations and surfaces corrected. A final hard steel troweling shall be done by hand, with the trowel tipped, and using hard pressure, when the surface is at a point that the trowel will produce a ringing sound. The finished surface shall be thoroughly consolidated and shall be essentially free of trowel marks and be uniform in texture and appearance. The concrete mixture used for troweled finished areas shall be adjusted, if necessary, in order to provide sufficient fines (cementitious material and fine sand) to finish properly.

3.9.5 Non-Slip Finish

Non-slip floors shall be constructed in accordance with the following subparagraphs.

3.9.5.1 Broomed

Exterior walkways, ramps and hardstands shall be given a broomed finish. After floating, the surface shall be lightly steel troweled, and then carefully scored by pulling a hair coarse fiber push-type broom across the surface. Brooming shall be transverse to traffic or at right angles to the slope of the slab. After the end of the curing period, the surface shall be vigorously broomed with a coarse fiber broom to remove all loose or semi-detached particles.

3.9.6 Heavy Duty Floors

All interior refrigerated spaces shall have heavy duty floors constructed as follows:

3.9.6.1 General

Heavy duty floor shall be constructed by placing a heavy duty bonded topping. Concrete in the base slab shall be thoroughly hardened but not more than 30 hours old. The temperature of the fresh concrete topping

shall not vary more than 5 degrees C plus or minus from the temperature of the base slab. The ambient temperature of the space adjacent to the concrete placement and of the base slab shall be between 10 and 30 degrees C.

3.9.6.2 Placing and Finishing

Concrete shall be placed, as nearly as practicable in final position, in a uniform layer. The overlay shall be placed and screeded slightly above the required finished grade, compacted by rolling with rollers weighing not less than 4.5 kg per linear 25 mm of roller width or by approved tamping equipment and finish screeded to established grade. Grid type tampers shall not be used. The concrete, while still green but sufficiently hardened to bear a person's weight without deep imprint, shall be floated to a true even plane with no coarse aggregate visible. Floating shall be performed with an approved disc-type mechanical float which has integral impact mechanism. The surface of the overlay shall then be left undisturbed until the concrete has hardened enough to prevent excess fines from being worked to the top. Joints shall be formed to match those in the base slab.

3.9.6.3 Curing and Protection

Concrete shall be maintained in a moist condition and shall be protected against rapid temperature change, mechanical injury, and injury from rain or flowing water, for a curing period of not less than 10 days. Concrete shall be maintained in a moist condition at temperatures above 10 and below 30 degrees C throughout the specified curing period. Concrete shall be protected from a temperature change greater than 3 degrees C per hour and from rapid drying for the first 24 hours following the removal of temperature protection. Curing activities shall begin as soon as free water has disappeared from the concrete surface after placing and finishing. Curing shall be moist curing accomplished by the following method. Surfaces shall be covered with a double layer of burlap, wetted before placing, and overlapped at least 150 mm. Burlap shall be kept continually wet and in intimate contact with the surface. Burlap shall be kept covered with a polyethylene sheeting at least 0.1 mm thick. All traffic shall be kept from the floor during the curing period and heavy traffic shall be kept off till 28-day age.

3.10 FLOOR HARDENER

Areas as indicated on the drawings shall be treated with floor hardener. Floor hardener shall be applied after the concrete has been cured and then air dried for 28 days. Three coats shall be applied, each the day after the preceding coat was applied. For the first application, 0.5 kg of the silocofluoride shall be dissolved in 4 liters of water. For subsequent applications, the solution shall be 1.0 kg of silicofluoride to each 4 liters of water. Floor should be mopped with clear water shortly after the preceding application has dried to remove encrusted salts. Proprietary hardeners shall be applied in accordance with the manufacturer's instructions. During application, area should be well ventilated. Precautions shall be taken when applying silicofluorides due to the toxicity of the salts. Any compound that contacts glass or aluminum should be immediately removed with clear water.

3.11 EXTERIOR SLAB AND RELATED ITEMS

3.11.1 Pavements

Pavements shall be constructed where shown on the drawings. After forms are set and underlying material prepared as specified, the concrete shall be placed uniformly throughout the area and thoroughly vibrated. As soon as placed and vibrated, the concrete shall be struck off and screeded to the crown and cross section and to such elevation above grade that when consolidated and finished, the surface of the pavement will be at the required elevation. The entire surface shall be tamped with the strike off, or consolidated with a vibrating screed, and this operation continued until the required compaction and reduction of internal and surface voids are accomplished. Care shall be taken to prevent bringing excess paste to the surface. Immediately following the final consolidation of the surface, the pavement shall be floated longitudinally from bridges resting on the side forms and spanning but not touching the concrete. If necessary, additional concrete shall be placed and screeded, and the float operated until a satisfactory surface has been produced. The floating operation shall be advanced not more than half the length of the float and then continued over the new and previously floated surfaces. After finishing is completed but while the concrete is still plastic, minor irregularities and score marks in the pavement surface shall be eliminated by means of long-handled cutting straightedges. Straightedges shall be 3.75 m in length and shall be operated from the sides of the pavement and from bridges. A straightedge operated from the side of the pavement shall be equipped with a handle 1 m longer than one-half the width of the pavement.

The surface shall then be tested for trueness with a 3.75 straightedge held in successive positions parallel and at right angles to the center line of the pavement, and the whole area covered as necessary to detect variations. The straightedge shall be advanced along the pavement in successive stages of not more than one-half the length of the straightedge.

Depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. The straightedge testing and finishing shall continue until the entire surface of the concrete is true. Before the surface sheen has disappeared and well before the concrete becomes nonplastic, the surface of the pavement shall be given a nonslip sandy surface texture by use of a burlap drag. A strip of clean, wet burlap from 1.0 to 1.5 m wide and 0.7 m longer than the pavement width shall be carefully pulled across the surface. Edges and joints shall be rounded with an edger having a radius of 3 mm. Curing shall be as specified.

3.11.2 Sidewalks

Concrete shall be 100 mm minimum thickness. Contraction joints shall be provided at 1.75 m spaces unless otherwise indicated. Contraction joints shall be cut 25 mm deep with a jointing tool after the surface has been finished. Transverse expansion joints 12 mm thick shall be provided at changes in direction and where sidewalk abuts curbs, steps, rigid pavement, or other similar structures. Sidewalks shall be given a lightly broomed finish. A transverse slope of 1 mm per 50 mm shall be provided, unless otherwise indicated. Variations in cross section shall be limited to 1 mm per 250 mm.

3.11.3 Curbs and Gutters

Concrete shall be formed, placed, and finished by hand using a properly shaped "mule" or constructed using a slipform machine specially designed for this work. Contraction joints shall be cut 75 mm deep with a jointing tool after the surface has been finished. Expansion joints (12 mm wide)

shall be provided at 35 m maximum spacing unless otherwise indicated. Exposed surfaces shall be finished using a stiff bristled brush.

3.11.4 Pits and Trenches

Pits and trenches shall be constructed as indicated on the drawings. Bottoms and walls shall be placed monolithically or waterstops and keys, shall be provided as approved.

3.12 CURING AND PROTECTION

3.12.1 General

Concrete shall be cured by an approved method for the period of time given below:

Concrete with Type III cement	3 days
All other concrete	7 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period. Air and forms in contact with concrete shall be maintained at a temperature above 10 degrees C for the first 3 days and at a temperature above 0 degrees C for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure, and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except as otherwise permitted by paragraph Membrane Forming Curing Compounds, moist curing shall be provided for any areas to receive floor hardener, any paint or other applied coating, or to which other concrete is to be bonded.

Concrete containing silica fume shall be initially cured by fog misting during finishing, followed immediately by continuous moist curing. Except for plastic coated burlap, impervious sheeting alone shall not be used for curing.

3.12.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, nonsupporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day.

3.12.3 Membrane Forming Curing Compounds

Concrete may be cured with a nonpigmented curing compound containing a fugitive dye in lieu of moist curing. Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete, including surfaces to which a smooth finish is to be applied or other concrete to be bonded. However, a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements, may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. All surfaces shall be thoroughly moistened with water. Curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 500 kPa, at a uniform coverage of not more than 10 cubic meters per L for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. Surfaces on which clear compound is used shall be shaded from direct rays of the sun for the first 3 days. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

3.12.4 Impervious Sheeting

Impervious-sheet curing shall only be used on horizontal or nearly horizontal surfaces. Surfaces shall be thoroughly wetted and be completely covered with the sheeting. Sheeting shall be at least 450 mm wider than the concrete surface to be covered. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 300 mm and securely weighted down or shall be lapped not less than 100 mm and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

3.12.5 Ponding or Immersion

Concrete shall be continually immersed throughout the curing period. Water shall not be more than 10 degrees C less than the temperature of the concrete.

3.13 SETTING BASE PLATES AND BEARING PLATES

After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding mortar, except where nonshrink grout is indicated. The thickness of the

mortar or grout shall be approximately 1/24 the width of the plate, but not less than 20 mm. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed. Nonshrink grout shall be used as indicated on the drawings.

3.13.1 Damp-Pack Bedding Mortar

Damp-pack bedding mortar shall consist of 1 part cement and 2-1/2 parts fine aggregate having water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed.

The space between the top of the concrete and bottom of the bearing plate or base shall be packed with the bedding mortar by tamping or ramming with a bar or rod until it is completely filled.

3.13.2 Nonshrink Grout

Nonshrink grout shall be a ready-mixed material requiring only the addition of water. Water content shall be the minimum that will provide a flowable mixture and completely fill the space to be grouted without segregation, bleeding, or reduction of strength.

3.13.2.1 Mixing and Placing of Nonshrink Grout

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified therein. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or machinery-bearing surface and the plate shall be filled solid with the grout. Forms shall be of wood or other equally suitable material for completely retaining the grout on all sides and on top and shall be removed after the grout has set. The placed grout shall be carefully worked by rodding or other means to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 18 to 30 degrees C until after setting.

3.13.2.2 Treatment of Exposed Surfaces

For metal-oxidizing nonshrink grout, exposed surfaces shall be cut back 25 mm and immediately covered with a parge coat of mortar consisting of 1 part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient water to make a plastic mixture. The parge coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall have a smooth-dense finish and be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

3.14 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM

C 1077. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site.

3.14.1 Grading and Corrective Action

3.14.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.14.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.14.2 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

3.14.3 Scales, Batching and Recording

The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during

a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.14.4 Batch-Plant Control

The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic meter, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic meter for each class of concrete batched during each day's plant operation.

3.14.5 Concrete Mixture

- a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231 for normal weight concrete and ASTM C 173 for lightweight concrete. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph Air Entrainment. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation

samples shall be taken at the placement site as required by the Contracting Officer, and the air content at the mixer controlled as directed.

- b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted.
- c. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 12.5 mm below the maximum allowable slump specified in paragraph Slump in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 50 mm. Samples for slump shall be taken at the mixer. However, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the slump at the mixer controlled as directed.
- d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or

lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.

- e. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.
- f. Strength Specimens. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 380 cubic meters or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph Strength Requirements in PART 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. A set of test specimens for concrete with a 90-day strength per the same paragraph shall consist of six specimens, two tested at 7 days, two at 28 days, and two at 90 days. Test specimens shall be molded and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39 for test cylinders and ASTM C 78 for test beams. Results of all strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph Strength Requirements in PART 1) moving average of last 3 "tests" for strength, and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

3.14.6 Inspection Before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.14.7 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Contracting Officer, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman

shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.14.8 Vibrators

The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph Consolidation, shall be immediately removed from service and repaired or replaced.

3.14.9 Curing Inspection

- a. Moist Curing Inspections. At least once each shift, and not less than twice per day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by 1 day.
- c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered, shall compute the rate of coverage in square meters per Liter, and shall note whether or not coverage is uniform.
- d. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.
- f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

3.14.10 Mixer Uniformity

- a. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 60,000 cubic meters of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94.
- b. Truck Mixers. Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.
- c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.14.11 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 08 - DOORS & WINDOWS

SECTION 08700

BUILDERS' HARDWARE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
 - 1.2.1 Keying System
 - 1.2.2 Hardware and Accessories
- 1.3 PREDELIVERY CONFERENCE
- 1.4 DELIVERY, STORAGE, AND HANDLING
- 1.5 SPECIAL TOOLS
- 1.6 WARRANTY

PART 2 PRODUCTS

- 2.1 GENERAL HARDWARE REQUIREMENTS
- 2.2 TEMPLATES
- 2.3 HINGES
 - 2.3.1 Hinges for Reverse Bevel Doors with Locks
- 2.4 LOCKS AND LATCHES
 - 2.4.1 Mortise Lock
 - 2.4.2 Lock Cylinders
 - 2.4.3 Padlock
 - 2.4.4 Lock Trim
- 2.5 KEYING
- 2.6 DOOR CLOSING DEVICES
 - 2.6.1 Surface Type Closers
- 2.7 ARCHITECTURAL DOOR TRIM
 - 2.7.1 Door Protection Plates
 - 2.7.1.1 Kick Plates
 - 2.7.2 Push Plates
 - 2.7.2.1 Flat Plates
 - 2.7.3 Door Pulls
- 2.8 AUXILIARY HARDWARE
- 2.9 MISCELLANEOUS
 - 2.9.1 Door Gasketing Systems
 - 2.9.2 Metal Thresholds
 - 2.9.3 Cane Bolts
 - 2.9.4 Door Stops
- 2.10 FASTENINGS
- 2.11 FINISHES
- 2.12 HARDWARE FOR FIRE DOORS

PART 3 EXECUTION

- 3.1 APPLICATION
 - 3.1.1 Door-Closing Devices
 - 3.1.2 Kick Plates

- 3.1.3 Auxiliary Hardware
- 3.1.4 Thresholds
- 3.1.5 Rain Drips
- 3.2 HARDWARE SETS**

-- End of Section Table of Contents --

SECTION 08700

BUILDERS' HARDWARE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM F 883 (1997) Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA L & R Directory (Effective thru Jun 1999) Directory of Certified Locks & Latches

BHMA Closer Directory (Effective thru Jul (1999) Directory of Certified Door Closers

BHMA Exit Devices Directory (Effective thru Aug 1998) Directory of Certified Exit Devices

BHMA A156.1 (1997) Butts and Hinges

BHMA A156.2 (1996) Bored and Preassembled Locks and Latches

BHMA A156.4 (1992) Door Controls - Closers

BHMA A156.5 (1992) Auxiliary Locks & Associated Products

BHMA A156.6 (1994) Architectural Door Trim

BHMA A156.7 (1997) Template Hinge Dimensions

BHMA A156.13 (1994) Mortise Locks & Latches

BHMA A156.14 (1985) Sliding and Folding Door Hardware (BHMA 401)

BHMA A156.16 (1989) Auxiliary Hardware

BHMA A156.18 (1993) Materials and Finishes

BHMA A156.21 (1996) Thresholds

BHMA A156.22 (1996) Door Gasketing Systems

DOOR AND HARDWARE INSTITUTE (DHI)

DHI Keying Systems	(1989) Keying Systems and Nomenclature
DHI Locations for CSD	(1997) Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames
DHI Locations for SSD	(1990) Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames
DHI ANSI/DHI A115.1G	(1994) Installation Guide for Doors and Hardware
DHI ANSI/DHI A115-W	(Varies) Wood Door Hardware Standards (Incl A115-W1 thru A115-W9)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(1999) Fire Doors and Fire Windows
NFPA 101	(2000) Life Safety Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Hardware Schedule.

Hardware schedule listing all items to be furnished. The schedule shall include for each item: the quantities; manufacturer's name and catalog numbers; the ANSI number specified, sizes; detail information or catalog cuts; finishes; door and frame size and materials; location and hardware set identification cross-references to drawings; corresponding reference standard type number or function number from manufacturer's catalog if not covered by ANSI or BHMA; and list of abbreviations and template numbers.

Keying; G, RE

Keying schedule developed in accordance with DHI Keying Systems, after the keying meeting with the user.

Keying System; G, RE

1.2.1 Keying System

Submit key bitting charts to the Contracting Officer prior to completion of the contract. Include:

- a. Complete listing of all keys (1AA, 2AA, etc.)
- b. Complete listing of all keys cut (1AA-123456, 2AA-123458, etc.)

- c. Tabulation showing which key fits which door.
- d. Copy of floor plan on (8-1/2" x 11") 212 mm x 275 mm sheets showing doors and door numbers.

SD-07 Certificates

Hardware and Accessories.

1.2.2 Hardware and Accessories

The hardware manufacturer's certificates of compliance stating that the supplied material or hardware item meets specified requirements. Each certificate shall be signed by an official authorized to certify in behalf of the product manufacturer and shall identify quantity and date or dates of shipment or delivery to which the certificates apply. A statement that the proposed hardware items appear in BHMA L & R Directory, BHMA Closer Directory and BHMA Exit Devices Directory directories of certified products may be submitted in lieu of certificates.

1.3 PREDELIVERY CONFERENCE

Upon approval of the Hardware Schedule, the construction Contractor shall arrange a conference with the hardware supplier, Contracting Officer and the using agency to determine keying system requirements. Location of the key control storage system, set-up and key identification labeling will also be determined.

1.4 DELIVERY, STORAGE, AND HANDLING

Hardware shall be delivered to the project site in the manufacturer's original packages. Each article of hardware shall be individually packaged in the manufacturer's standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule. Each change key shall be tagged or otherwise identified with the door for which its cylinder is intended. Where double cylinder functions are used or where it is not obvious which is the key side of a door, appropriate instructions shall be included with the lock and on the hardware schedule. Manufacturer's printed installation instructions, fasteners, and special tools shall be included in each package.

1.5 SPECIAL TOOLS

Special tools, such as those supplied by the manufacturer, unique wrenches, and dogging keys, shall be provided as required to adjust hardware items.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

PART 2 PRODUCTS

2.1 GENERAL HARDWARE REQUIREMENTS

Hardware shall conform to the requirements specified herein and the HARDWARE SETS listing at the end of this section. Hardware set numbers correspond to the set numbers shown on the drawings.

2.2 TEMPLATES

Requirements for hardware to be mounted on metal doors or metal frames shall be coordinated between hardware manufacturer and door or frame manufacturer by use of templates and other information to establish location, reinforcement required, size of holes, and similar details. Templates of hinges shall conform to BHMA A156.7.

2.3 HINGES

Hinges shall conform to BHMA A156.1. Hinges used on FRP doors and frames shall also conform to BHMA A156.7. Except as otherwise specified, hinge sizes shall conform to the hinge manufacturer's printed recommendations.

2.3.1 Hinges for Reverse Bevel Doors with Locks

Hinges for reverse bevel doors with locks shall have pins that are made nonremovable by means such as a set screw in the barrel, or safety stud, when the door is in the closed position.

2.4 LOCKS AND LATCHES

To the maximum extent possible, locksets, latchsets and deadlocks, and all components thereof, including cylinders shall be the products of a single manufacturer. Strikes for wood frames shall be furnished with wrought boxes.

2.4.1 Mortise Lock

Mortise lock, latchsets, and strikes shall be series 1000 and shall conform to BHMA A156.13, operational Grade 1, lever handles. Mortise type locks and latches for doors 44 mm thick and over shall have adjustable bevel fronts or otherwise conform to the shape of the door. Mortise locks shall have armored fronts.

2.4.2 Lock Cylinders

Lock cylinders shall comply with BHMA A156.5. Lock cylinder shall have not less than seven pins. Cylinders shall have key removable type cores. A master keying shall be provided. All locks shall accept a "Best" compatible figure eight, seven (7) pin, interchangeable core in "A" keyway, or approved equal.

2.4.3 Padlock

ASTM F 883, Type PO1, Grade 6.

2.4.4 Lock Trim

Lock trim shall be cast, forged, or heavy wrought construction of commercial plain design. In addition to meeting the test requirement of BHMA A156.2 or BHMA A156.13, lever handles, roses, and escutcheons shall be 1.27 mm thick, if unreinforced. Lever handles shall be of plain design with ends returned to no more than 10 mm from the door face.

2.5 KEYING

All keys shall be stamped with an ID code or "Keymark", do not use the pin code, 7on one side of the key bow and "Property of the U.S. Government - DO

NOT Duplicate" on the other side. Keys shall be supplied as follows:

Locks:	2 change keys each lock.
Master keyed sets:	3 keys each set.
Control Key	1 each.

The keys shall be furnished to the Contracting Officer.

2.6 DOOR CLOSING DEVICES

Door closing devices shall conform to BHMA A156.4, Grade 1. Closing devices shall be products of one manufacturer for each type specified. The opening resistance of closing devices shall not exceed 67 N applied at the latch stile or exceed 22 N where low opening resistance is scheduled.

2.6.1 Surface Type Closers

Surface type closers shall be Grade 1, Series C02000 Full Cover with options PT-4H, Size 1 or 2 through Size 6, and PT-4D with back check position valve. Except as otherwise specified, sizes shall conform to the manufacturer's published recommendations. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb mounted.

2.7 ARCHITECTURAL DOOR TRIM

Architectural door trim shall conform to BHMA A156.6.

2.7.1 Door Protection Plates

2.7.1.1 Kick Plates

Kick plates shall be Type J102 stainless steel. Width of plates shall be 50 mm less than door width for single doors and 25 mm less for pairs of doors. Height shall be 300 mm, Edges of metal plates shall be beveled.

2.7.2 Push Plates

2.7.2.1 Flat Plates

Flat plates shall be Type J301 1.27 mm thick stainless steel. Edges of metal plates shall be square beveled.

2.7.3 Door Pulls

Door pulls shall be Category J402 stainless steel of plain modern design.

2.8 AUXILIARY HARDWARE

Auxiliary hardware, consisting of door holders and door stops, shall conform to BHMA A156.16. Lever extension flush bolts shall be Type L14081.

2.9 MISCELLANEOUS

2.9.1 Door Gasketing Systems

Head and jamb type, self adhesive: BHMA A156.22, ROY154.

Door sweep: BHMA A156.22, ROY414.

Door sweep shoe type: BHMA A156.22, ROY434.

2.9.2 Metal Thresholds

Thresholds shall conform to BHMA A156.21. Thresholds for exterior doors shall be extruded aluminum of the type indicated and shall provide proper clearance and an effective seal with specified weather stripping.

2.9.3 Cane Bolts

BHMA A156.14, D8441, 375 mm long.

2.9.4 Door Stops

Wall stops, floor stops and combination stop and holders shall conform to BHMA A156.16.

2.10 FASTENINGS

Fastenings of proper type, size, quantity, and finish shall be supplied with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete or masonry. Fastenings included bolts, nuts and screws in the finished work shall be of stainless steel.

2.11 FINISHES

Unless otherwise specified, finishes shall conform to those identified in BHMA A156.18. Where painting of primed surfaces is required, painting is specified in Section 09900 PAINTING, GENERAL.

2.12 HARDWARE FOR FIRE DOORS

Hardware for fire doors shall conform to the requirements of NFPA 80 and NFPA 101.

PART 3 EXECUTION

3.1 APPLICATION

Hardware shall be located in accordance with DHI Locations for CSD and DHI Locations for SSD, except that deadlocks shall be mounted 1220 mm above finish floor. When approved, slight variations in locations or dimensions will be permitted. Application shall be in accordance with DHI ANSI/DHI A115.1G or DHI ANSI/DHI A115-W. Door control devices for exterior doors such as closers and holders, shall be attached to doors with thru bolts and nuts or sex bolts. Alternate fastening methods may be approved by the Contracting Officer when manufacturers' documentation is submitted to verify that the fastening devices and door reinforcements are adequate to resist wind induced stresses.

3.1.1 Door-Closing Devices

Door-closing devices shall be installed and adjusted in accordance with the templates and printed instructions supplied by the manufacturer of the devices. Insofar as practicable, doors opening to or from halls and corridors shall have the closer mounted on the room side of the door.

3.1.2 Kick Plates

Kick plates shall be installed on the push side of single-acting doors.

3.1.3 Auxiliary Hardware

Lever extension flush bolts shall be installed at the top and bottom of the inactive leaf of pairs of doors. The bottom bolt shall operate into a dust-proof floor strike or threshold.

3.1.4 Thresholds

Thresholds shall be secured with a minimum of three fasteners per single door width and six fasteners per double door width with a maximum spacing of 300 mm. Exterior thresholds shall be installed in a bed of sealant with expansion anchors and stainless steel screws, except that bronze or anodized bronze thresholds shall be installed with expansion anchors with brass screws. Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 19 mm thread engagement into the floor or anchoring device used.

3.1.5 Rain Drips

Door sill rain drips shall align with the bottom edge of the door. Overhead rain drips shall align with bottom edge of door frame rabbet. Drips shall be set in sealant and fastened with stainless steel screws.

3.2 HARDWARE SETS

Set 1 (Doors D-1 & D-12, each office door)

- 1 1/2 pair butt hinges, A5112, 112 x 112 mm, BHMA 630
- 1 lockset, Series 1000, Grade 1, F13, BHMA 630, lever handle
- 1 door closer, C02011, BHMA 626
- 1 threshold, J32130, BHMA 628
- 1 wall bumper, L02101, BHMA 630
- 1 door sweep shoe type, ROY434.

Set 2 (Doors D-2, D-3, D-4, D-5, D-6, D-7, D-8, D-11, D-17, D-18, D-19, D-20, D-21, D-22, D-23, D-24, D-25, D-26, D-27, D-28, D-29, D-30, D-31, D-32, D-33 & D-34, each insulated cold storage door)

Door hardware to provided by insulated cold storage manufacturer. **See Section 13038 COLD STORAGE ROOMS.**

Set 3 (Doors D-9 & D-10, each double door)

- 3 pair butt hinges, A5112, 112 x 112 mm, BHMA 630, NRP
- 1 lockset, Series 1000, Grade 1, F13, BHMA 630, lever handle
- 1 door closer, C02021, BHMA 626
- 2 extension flush bolts, L04081, BHMA 630, 300 mm
- 1 threshold, J32130, BHMA 628
- 2 door holders, L01381, BHMA 630
- 2 door sweep, ROY414.

Set 4 (Door D-13, manager door)

- 1 1/2 pair butt hinges, A5112, 112 x 112 mm, BHMA 630
- 1 lockset, Series 1000, Grade 1, F04, BHMA 630, lever handle
- 1 wall bumper, L02101, BHMA 630

Set 5 (Door D-14, utility door)

- 1 1/2 pair butt hinges, A5112, 112 x 112 mm, BHMA 630
- 1 lockset, Series 1000, Grade 1, F04, BHMA 630, lever handle

Set 6 (Doors D-15 & D-16, each door)

- 1 1/2 pair butt hinges, A5112, 112 x 112 mm, BHMA 630
- 1 mortise deadlock, E16091, BHMA 630
- 1 door closer, C02011, BHMA 626
- 1 door pull, J405, BHMA 630
- 1 push plate, J304, BHMA 630
- 1 kick plate, J102, BHMA 630
- 1 wall bumper, L02251, BHMA 630

Set 7 (Doors D-35 & D-36, each access door)

- 1 pair butt hinges, A5112, 112 x 112 mm, BHMA 630, NRP
- 1 lockset, Series 1000, Grade 1, F13, BHMA 630, lever handle
- 1 door closer, C02021, BHMA 626
- 1 threshold, J32130, BHMA 628
- 1 door sweep shoe type, ROY434.
- 1 set self adhesive gasket, ROY154.

Set 8 (Door D-37, office door)

- 1 1/2 pair butt hinges, A5112, 112 x 112 mm, BHMA 630
- 1 lockset, Series 1000, Grade 1, F13, BHMA 630, lever handle
- 1 door closer, C02051, BHMA 626
- 1 threshold, J32130, BHMA 628
- 1 door sweep shoe type, ROY434.

Set 9 (Stainless Steel Mechanical Enclosure Gate)

- 2 pair butt hinges, A5112, 112 x 112 mm, BHMA 630
- 1 padlock
- 2 cane bolts, 375 mm long
- Hasp to be provided by gate manufacturer

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 03 - CONCRETE

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 LUMP SUM CONTRACT
- 1.3 SUBMITTALS
- 1.4 QUALIFICATIONS
- 1.5 FIELD TEST FLOOR SLAB
 - 1.5.1 Test Floor Slab
- 1.6 SPECIAL REQUIREMENTS
- 1.7 GENERAL REQUIREMENTS
 - 1.7.1 Tolerances
 - 1.7.1.1 Floors
 - 1.7.1.2 Floors by the Straightedge System
 - 1.7.2 Strength Requirements and w/c Ratio
 - 1.7.2.1 Strength Requirements
 - 1.7.2.2 Water-Cement Ratio
 - 1.7.3 Air Entrainment
 - 1.7.4 Slump
 - 1.7.5 Concrete Temperature
 - 1.7.6 Size of Coarse Aggregate
 - 1.7.7 Special Properties and Products
 - 1.7.8 Technical Service for Specialized Concrete
- 1.8 MIXTURE PROPORTIONS
 - 1.8.1 Proportioning Studies for Normal Weight Concrete
 - 1.8.2 Average Compressive Strength Required for Mixtures
 - 1.8.2.1 Computations from Test Records
 - 1.8.2.2 Computations without Previous Test Records
- 1.9 STORAGE OF MATERIALS
- 1.10 GOVERNMENT ASSURANCE INSPECTION AND TESTING
 - 1.10.1 Materials
 - 1.10.2 Fresh Concrete
 - 1.10.3 Hardened Concrete
 - 1.10.4 Inspection

PART 2 PRODUCTS

- 2.1 CEMENTITIOUS MATERIALS
 - 2.1.1 Portland Cement
- 2.2 AGGREGATES
 - 2.2.1 Fine Aggregate
 - 2.2.2 Coarse Aggregate
- 2.3 CHEMICAL ADMIXTURES
 - 2.3.1 Air-Entraining Admixture
 - 2.3.2 Water-Reducing or Retarding Admixture
 - 2.3.3 High-Range Water Reducer (HRWR)
 - 2.3.4 Evaporation Retarder

- 2.3.5 Delete
- 2.3.6 Shrinkage Reducing Admixture
- 2.4 CURING MATERIALS
 - 2.4.1 Impervious-Sheet
 - 2.4.2 Membrane-Forming Compound
 - 2.4.3 Burlap and Cotton Mat
- 2.5 WATER
- 2.6 NONSHRINK GROUT
- 2.7 LATEX MODIFIED NONSAG MORTAR
- 2.8 LATEX BONDING AGENT
- 2.9 EPOXY RESIN
- 2.10 VAPOR BARRIER
- 2.11 JOINT MATERIALS
 - 2.11.1 Joint Fillers, Sealers, and Waterstops
- 2.12 SYNTHETIC FIBERS FOR REINFORCING
- 2.13 Evaporative Retarder

PART 3 EXECUTION

- 3.1 PREPARATION FOR PLACING
 - 3.1.1 Foundations
 - 3.1.1.1 Concrete on Earth Foundations
 - 3.1.2 Preparation of Previously Placed Concrete
- 3.2 CONCRETE PRODUCTION
 - 3.2.1 Portable, Batching, Mixing, and Transporting Concrete
 - 3.2.1.1 General
 - 3.2.1.2 Batching Equipment
 - 3.2.1.3 Scales
 - 3.2.1.4 Portable Batching Tolerances
 - 3.2.1.5 Moisture Control
 - 3.2.1.6 Concrete Mixers
 - 3.2.1.7 Stationary Mixers
- 3.3 CONCRETE PRODUCTION, SMALL PROJECTS
- 3.4 FIBER REINFORCED CONCRETE
- 3.5 TRANSPORTING CONCRETE TO PROJECT SITE
- 3.6 CONVEYING CONCRETE ON SITE
 - 3.6.1 Buckets
 - 3.6.2 Transfer Hoppers
 - 3.6.3 Chutes
 - 3.6.4 Belt Conveyors
 - 3.6.5 Concrete Pumps
- 3.7 PLACING CONCRETE
 - 3.7.1 Depositing Concrete
 - 3.7.2 Consolidation
 - 3.7.3 Hot Weather Requirements
 - 3.7.4 Prevention of Plastic Shrinkage Cracking
- 3.8 JOINTS
 - 3.8.1 Construction Joints
 - 3.8.2 Contraction Joints in Slabs on Grade
 - 3.8.3 Expansion Joints
 - 3.8.4 Dowels and Tie Bars
- 3.9 FINISHING FORMED SURFACES
 - 3.9.1 Class B Finish
 - 3.9.2 Smooth Finish
- 3.10 REPAIRS
 - 3.10.1 Damp-Pack Mortar Repair
 - 3.10.2 Repair of Major Defects
 - 3.10.2.1 Surface Application of Mortar Repair
 - 3.10.2.2 Repair of Deep and Large Defects

- 3.11 FINISHING UNFORMED SURFACES
 - 3.11.1 General
 - 3.11.2 Rough Slab Finish
 - 3.11.3 Floated Finish
 - 3.11.4 Troweled Finish
- 3.12 CURING AND PROTECTION
 - 3.12.1 General
 - 3.12.2 Immersion Curing
- 3.13 SETTING BASE PLATES AND BEARING PLATES
 - 3.13.1 Nonshrink Grout
 - 3.13.1.1 Mixing and Placing of Nonshrink Grout
 - 3.13.1.2 Treatment of Exposed Surfaces
- 3.14 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL
 - 3.14.1 Grading and Corrective Action
 - 3.14.1.1 Fine Aggregate
 - 3.14.1.2 Coarse Aggregate
 - 3.14.2 Quality of Aggregates
 - 3.14.3 Scales, Batching and Recording
 - 3.14.4 Batch-Plant Control
 - 3.14.5 Concrete Mixture
 - 3.14.6 Inspection Before Placing
 - 3.14.7 Placing
 - 3.14.8 Vibrators
 - 3.14.9 Curing Inspection
 - 3.14.10 Mixer Uniformity
 - 3.14.11 Reports

-- End of Section Table of Contents --

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214.3R	(1988) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 301	(1996) Standard Specifications for Structural Concrete
ACI 305R	(1991) Hot Weather Concreting
ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31/C 31M	(1998) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1999a) Concrete Aggregates
ASTM C 39	(1996) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42	(1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 78	(1994) Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
ASTM C 94	(1999) Ready-Mixed Concrete
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates

ASTM C 143	(1998) Slump of Hydraulic Cement Concrete
ASTM C 150	(1998a) Portland Cement
ASTM C 171	(1997a) Sheet Materials for Curing Concrete
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 192/C 192M	(1998) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1998) Air-Entraining Admixtures for Concrete
ASTM C 494	(1999) Chemical Admixtures for Concrete
ASTM C 878	(1995, Rev A) Standard Test Method for Restrained Expansion of Shrinkage - Compressive Concrete
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 940	(1998a) Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
ASTM C 1017	(1998) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1059	(1999) Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C 1064/C 1064M	(1999) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1107	(1999) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 1116	(1995) Fiber-Reinforced Concrete and Shotcrete
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM E 96	(1995) Water Vapor Transmission of Materials
ASTM E 1745	(1997) Standard Specification for Plastic Water Vapor Retarders Used in Contract

with Soil or Granular Fill under Concrete
Slabs

CORPS OF ENGINEERS (COE)

COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(1997) NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices
------------	---

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1996) Concrete Plant Standards
NRMCA TMMB 100	(1994) Truck Mixer Agitator and Front Discharge Concrete Carrier Standards
NRMCA QC 3	(1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities

1.2 LUMP SUM CONTRACT

Under this type of contract concrete items will be paid for by lump sum and will not be measured. The work covered by these items consists of furnishing all concrete materials, reinforcement, miscellaneous embedded materials, and equipment, and performing all labor for the forming, manufacture, transporting, placing, finishing, curing, and protection of concrete in these structures.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Statements

Mixture Proportions; GA.

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of each strength or class of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an

approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

SD-09 Reports

Testing and Inspection for Contractor Quality Control; GA.

Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

SD-13 Certificates

Qualifications; GA.

Written documentation for Contractor Quality Control personnel.

SD-14 Samples

Surface Retarder; FIO.

Surface retarder material with manufacturer's instructions for application in conjunction with air-water cutting.

1.4 QUALIFICATIONS

Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field Testing Technician, Grade I
Concrete Laboratory Testing Technician, Grade I or II
Concrete Construction Inspector, Level II

Concrete Transportation Construction Inspector or
Reinforced Concrete Special Inspector, Jointly certified by American Concrete Institute (ACI), Building Officials and Code Administrators International (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International (SBCCI).

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

1.5 FIELD TEST FLOOR SLAB

Field test slabs shall be constructed 3 months prior to beginning of work using the materials and procedures proposed for use on the job, to demonstrate the results to be attained. The quality and appearance of the test slab shall be subject to the approval of the Contracting Officer, and, if not judged satisfactory, additional test slabs shall be constructed until approval is attained. Formed or finished surfaces in the completed

structure shall match the quality and appearance of the approved field example.

1.5.1 Test Floor Slab

The test floor slab shall be at least 4 feet by 5 feet and 6 inches thick. A full length expansion joint shall be constructed at the center of the test floor slab. All materials used for the actual expansion joint shall be used in the test floor slab. The concrete used for the test floor slab shall contain all admixtures used for the actual concrete. The test floor slab can be constructed in Honolulu or in Kwajalein and shall be available to the Contracting Officer for inspection.

1.6 SPECIAL REQUIREMENTS

A pre-installation meeting with the Contracting Officer will be required at least 10 days prior to start of construction. The Contractor shall be responsible for calling the meeting; the Project Superintendent and active installation personnel shall be present.

1.7 GENERAL REQUIREMENTS

1.7.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

1.7.1.1 Floors

For the purpose of this Section the following terminology correlation between ACI 117/117R and this Section shall apply:

Floor Profile Quality Classification From ACI 117/117R	This Section
-----	-----
Conventional Bullfloated	Same
Conventional Straightedged	Same
Flat	Float Finish or Trowel Finish
Very Flat	Same. Use only with F-system

Levelness tolerance shall apply where design requires floors to be sloped to drains or sloped for other reasons.

1.7.1.2 Floors by the Straightedge System

The flatness of the floors shall be carefully controlled and the tolerances shall be measured by the straightedge system as specified in paragraph 4.5.7 of ACI 117/117R, using a 5 foot and adjusted for slopes to drain, straightedge and adjusted for slopes to drain, within 72 hours after floor slab installation and before shores and/or forms are removed. The listed tolerances shall be met at any and every location at which the straightedge can be placed.

Bullfloated 1/2 inches

Straightedged 5/16 inches
 Float Finish 1/4 inches
 Trowel Finish 3/16 inches

1.7.2 Strength Requirements and w/c Ratio

1.7.2.1 Strength Requirements

Specified compressive strength (f'c) shall be as follows:

COMPRESSIVE STRENGTH	STRUCTURE OR PORTION OF STRUCTURE
4000 psi at 28 days	All

Compressive strength shall be determined in accordance with ASTM C 39.

- a. Evaluation of Concrete Compressive Strength. Compressive strength specimens (6 by 12 inch cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'c and no individual test result falls below the specified strength f'c by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.
- b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Government.
- c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being understrength shall be corrected in a manner

satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Contracting Officer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.

1.7.2.2 Water-Cement Ratio

Maximum water-cement ratio (w/c) for normal weight concrete shall be as follows:

WATER-CEMENT RATIO, BY WEIGHT	STRUCTURE OR PORTION OF STRUCTURE
0.45	All

These w/c's may cause higher strengths than that required above for compressive or flexural strength. The maximum w/c required will be the equivalent w/c as determined by conversion from the weight ratio of water to cement plus pozzolan, by the weight equivalency method as described in ACI 211.1.

1.7.3 Air Entrainment

Air Entrainment shall be required.

1.7.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143.

Structural Element	Slump	
	Minimum	Maximum
Foundation walls, substructure walls, footings, slabs	5 in.	6 in.

When use of a plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C 494 is permitted to increase the slump of concrete, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.

All normal weight concrete shall be air entrained to contain between 4 and 7 percent total air, except that when the nominal maximum size coarse aggregate is 3/4 inch or smaller it shall be between 3.5 and 5.5 percent. Concrete with specified strength over 5000 psi may have 1.0 percent less air than specified above. Specified air content for normal weight concrete shall be determined in accordance with ASTM C 231.

1.7.5 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 90 degrees F.

Concrete for the main water tank floor shall be placed at night between the hours of 08:00 pm and 06:00 AM.

1.7.6 Size of Coarse Aggregate

The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

1.7.7 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies. Admixture manufacturer shall provide written document showing compatibility of all materials.

1.7.8 Technical Service for Specialized Concrete

The services of a factory trained technical representative shall be obtained to oversee proportioning, batching, mixing, placing, consolidating, and finishing of concrete with HWWR admixture. A factory trained technical representative shall be present on site for the High-Range Water Reducer (HRWR) admixture. The technical representative shall be on the job full time until the Contracting Officer is satisfied that field controls indicate concrete of specified quality is furnished and that the Contractor's crews are capable of continued satisfactory work. The technical representative shall be available for consultation with, and advice to, Government forces.

1.8 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

1.8.1 Proportioning Studies for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Except as specified for flexural strength concrete, mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in subparagraph Water-Cement Ratio. Laboratory trial mixtures shall be designed for maximum permitted slump and

air content. Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192/C 192M. They shall be tested at 7 and 28 days in accordance with ASTM C 39. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and 28 day strengths. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

1.8.2 Average Compressive Strength Required for Mixtures

The mixture proportions selected during mixture design studies shall produce a required average compressive strength (f'_{cr}) exceeding the specified compressive strength (f'_c) by the amount indicated below. This required average compressive strength, f'_{cr} , will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below f'_{cr} during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day f'_{cr} , the mixture shall be adjusted, as approved, to bring the daily average back up to f'_{cr} . During production, the required f'_{cr} shall be adjusted, as appropriate, based on the standard deviation being attained on the job.

1.8.2.1 Computations from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths (f'_c) within 1,000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength f'_{cr} used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

$$f'_{cr} = f'_c + 1.34S \text{ where units are in psi}$$

$$f'_{cr} = f'_c + 2.33S - 500 \text{ where units are in psi}$$

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

1.8.2.2 Computations without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f'_{cr} shall be determined as follows:

- a. If the specified compressive strength f'_c is less than 3,000 psi,
 $f'_{cr} = f'_c + 1000 \text{ psi}$
- b. If the specified compressive strength f'_c is 3,000 to 5,000 psi,
 $f'_{cr} = f'_c + 1,200 \text{ psi}$
- c. If the specified compressive strength f'_c is over 5,000 psi,
 $f'_{cr} = f'_c + 1,400 \text{ psi}$

1.9 STORAGE OF MATERIALS

Cement and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements. Materials shall be capable of being accurately identified after bundles or containers are opened.

1.10 GOVERNMENT ASSURANCE INSPECTION AND TESTING

Day-to day inspection and testing shall be the responsibility of the Contractor Quality Control (CQC) staff. However, representatives of the Contracting Officer can and will inspect construction as considered appropriate and will monitor operations of the Contractor's CQC staff. Government inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

1.10.1 Materials

The Government will sample and test aggregates, cementitious materials, other materials, and concrete to determine compliance with the specifications as considered appropriate. The Contractor shall provide facilities and labor as may be necessary for procurement of representative

test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Other materials will be sampled from storage at the jobsite or from other locations as considered appropriate. Samples may be placed in storage for later testing when appropriate.

1.10.2 Fresh Concrete

Fresh concrete will be sampled as delivered in accordance with ASTM C 172 and tested in accordance with these specifications, as considered necessary.

1.10.3 Hardened Concrete

Tests on hardened concrete will be performed by the Government when such tests are considered necessary.

1.10.4 Inspection

Concrete operations may be tested and inspected by the Government as the project progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered nor will it obligate the Government for final acceptance.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement or portland-pozzolan and shall conform to appropriate specifications listed below.

2.1.1 Portland Cement

ASTM C 150, type II including false set requirements.

2.2 AGGREGATES

Aggregates shall conform to the following.

2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33, Class 5S, size designation 67.

2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

2.3.1 Air-Entraining Admixture

Air-Entraining Admixture shall not be used.

2.3.2 Water-Reducing or Retarding Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

2.3.3 High-Range Water Reducer (HRWR)

Eucon 37, Euclid chemical company or approved equal IAW ASTM C 494, Type F or G, except that the 6-month and 1-year strength requirements are waived.

2.3.4 Evaporation Retarder

Eucobar , Euclid Chemical Company, or approved equal.

2.3.5 Delete

2.3.6 Shrinkage Reducing Admixture

Shrinkage Reducing Admixture shall be Eclipse Shrinkage Reducing Admixture, by Grace Construction Products, or approved equal. Approved equal product shall be capable of 25% minimum reduction of ultimate drying shrinkage and shall be NSF approved for potable water tanks. Maximum reduction of specified 28 day concrete compressive strength shall be 15% (600 psi) to 3400 psi. The admixture shall be formulated and applied in accordance with the manufacturer's recommendations.

2.4 CURING MATERIALS

2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

2.4.2 Membrane-Forming Compound

Membrane-Forming curing compound shall not be used.

2.4.3 Burlap and Cotton Mat

Burlap and cotton mat shall not be used.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107, and shall be a commercial formulation suitable for the proposed application.

2.7 LATEX MODIFIED NONSAG MORTAR

Latex Modified Nonsag Mortar for Vertical Concrete Surface Repairs shall be one of the following materials (or approved equal)

Vertical Supreme, Euclid Chemical Company
 Thorite Rapid Vertical, Bonded Manufacturing Company
 Polyfast, Dayton Superior Company
 Tamms Speed Crete

Approved equal material shall be latex modified nonsag cement based mortar suitable for vertical application without forming, having a 7 day compressive strength of 5000 psi and flexural strength of 650 psi. Surface preparation shall consist of sandblasting, and mechanical scarifying of the entire surface on which material is to be placed.

2.8 LATEX BONDING AGENT

Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

2.9 EPOXY RESIN

Epoxy resins for use in repairs shall conform to ASTM C 881, Type V. Grade and Class as appropriate for application.

2.10 VAPOR BARRIER

Vapor barrier material shall have the following properties:

Minimum 15-mil thick polyolefin geomembrane
Manufactured with ISO certified virgin resins.
Water Vapor Retarder ASTM E 1745 meets or exceeds Class B requirements with following modification;
Permeance Rating ASTM E 96 not exceeding 0.02 Perms

2.11 JOINT MATERIALS

2.11.1 Joint Fillers, Sealers, and Waterstops

Materials for expansion joints and waterstops shall be in accordance with Section 03150 EXPANSION JOINTS, CONTRACTION JOINTS and joint sealants for expansion joints.

2.12 SYNTHETIC FIBERS FOR REINFORCING

Concrete shall contain synthetic fibers conforming to ASTM C 1116, Type III, Synthetic Fiber 7.5 lbs per cy. Fibers shall be 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials. Fibers shall have a specific gravity of 0.9, a minimum tensile strength of 70 ksi graded per manufacturer, and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement.

2.13 Evaporative Retarder

Evaporative Retarder shall be sprayed over the fresh concrete surface immediately after bullfloating of the concrete floor slab. The evaporative retarder shall be Eucobar, by Euclid Chemical Company or approved equal. Spray equipment, mixing and application rate, installation shall be per manufacturers instructions. The evaporative retarder shall be used only to prevent rapid evaporation of the concrete slab moisture and shall not be used as a finishing aid.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed.

Surfaces to receive concrete shall be clean and free from mastic. Forms shall be in place, cleaned, coated, and adequately supported. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200 CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Foundations

3.1.1.1 Concrete on Earth Foundations

Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.

3.1.2 Preparation of Previously Placed Concrete

Concrete surfaces to which other concrete is to be bonded shall be abraded in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Apply epoxy bonding agent immediately prior to placing new concrete.

3.2 CONCRETE PRODUCTION

3.2.1 Portable, Batching, Mixing, and Transporting Concrete

All concrete shall be batched after sunset and before sunrise. Concrete shall either be batched and mixed onsite by on-site batch plant and transpoiled accordance with ASTM C 94. Concrete truck mixers shall not be used. Concrete shall be batched and mixed onsite, or close to onsite, and shall conform to the following subparagraphs.

3.2.1.1 General

The batching plant shall be located on site in the general area approved by the Contracting Officer. The batching, mixing and placing system shall have a capacity of at least 75 cubic yards per hour. The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

3.2.1.2 Batching Equipment

The batching controls shall be semiautomatic or automatic, as defined in NRMCA CPMB 100. A semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. The weight of water and admixtures shall be recorded if batched by weight. Separate bins or compartments shall be provided for each size group of aggregate and type of cementitious

material, to prevent intermingling at any time. Aggregates shall be weighed either in separate weigh batchers with individual scales or, provided the smallest size is batched first, cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cementitious material. If both portland cement and other cementitious material are used, they may be batched cumulatively, provided that the portland cement is batched first, except that silica fume shall always be batched separately. Water may be measured by weight or volume. Water shall not be weighed or measured cumulatively with another ingredient. Filling and discharging valves for the water metering or batching system shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. Piping for water and for admixtures shall be free from leaks and shall be properly valved to prevent backflow or siphoning. Admixtures shall be furnished as a liquid of suitable concentration for easy control of dispensing. An adjustable, accurate, mechanical device for measuring and dispensing each admixture shall be provided. Each admixture dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and individually discharged automatically in a manner to obtain uniform distribution throughout the water as it is added to the batch in the specified mixing period. When use of truck mixers makes this requirement impractical, the admixture dispensers shall be interlocked with the sand batchers. Different admixtures shall not be combined prior to introduction in water and shall not be allowed to intermingle until in contact with the cement. Admixture dispensers shall have suitable devices to detect and indicate flow during dispensing or have a means for visual observation. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment, and for sampling and calibrating the dispensing of cementitious material, water, and admixtures. Filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

3.2.1.3 Scales

The weighing equipment shall conform to the applicable requirements of CPMB Concrete Plant Standard, and of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. The tests shall be made at the specified frequency in the presence of a Government inspector. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

3.2.1.4 Portable Batching Tolerances

(A) Tolerances with Weighing Equipment

MATERIAL	PERCENT OF REQUIRED WEIGHT
Cementitious materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1
Chemical admixture	0 to plus 6

MATERIAL	PERCENT OF REQUIRED WEIGHT
----------	-------------------------------

(B) Tolerances with Volumetric Equipment

For volumetric batching equipment used for water and admixtures, the following tolerances shall apply to the required volume of material being batched:

MATERIAL	PERCENT OF REQUIRED MATERIAL
Water:	plus or minus 1 percent
Chemical admixtures:	0 to plus 6 percent

3.2.1.5 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the weights of the materials being batched.

3.2.1.6 Concrete Mixers

Mixers shall be stationary mixers. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

3.2.1.7 Stationary Mixers

Concrete plant mixers shall be drum-type mixers of tilting, nontilting, horizontal-shaft, or vertical-shaft type, or shall be pug mill type and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time and uniformity shall conform to all the requirements in ASTM C 94 applicable to central-mixed concrete.

3.3 CONCRETE PRODUCTION, SMALL PROJECTS

Batch-type equipment shall be used for producing concrete. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94, except as otherwise specified. Agitators, and nonagitating transporting units shall comply with NRMCA TMMB 100. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete. Site-mixed concrete shall be produced in accordance with ACI 301, and plant shall conform to NRMCA CPMB 100.

3.4 FIBER REINFORCED CONCRETE

Fiber reinforced concrete shall conform to ASTM C 1116 and as follows, using the fibers specified in PART 2. A minimum of 1.5 pounds of fibers per cubic yard of concrete shall be used. Fibers shall be added at the

batch plant. Toughness indices shall meet requirements for performance level I of ASTM C 1116. The services of a qualified technical representative shall be provided to instruct the concrete supplier in proper batching and mixing of materials to be provided.

3.5 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in agitators, nonagitator transporting equipment conforming to NRMCA TMMB 100 or by approved pumping equipment or conveyors.

3.6 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

3.6.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

3.6.2 Transfer Hoppers

Concrete may be charged into nonagitator hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and shall have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitator transfer hoppers more than 30 minutes.

3.6.3 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitator equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

3.6.4 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means, such as discharge baffle or hopper, for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches.

The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed

horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant truck that is long enough to extend through the reinforcing bars.

3.6.5 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.7 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.7.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

3.7.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite

during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segregation or flotation of coarse aggregate shall be prevented. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

3.7.3 Hot Weather Requirements

Concrete shall be placed at night. When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064M. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	90 F
40-60	85 F
Less than 40	80 F

3.7.4 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage

cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.8 JOINTS

Joints shall be located and constructed only as indicated or approved.

3.8.1 Construction Joints

Construction joints are not permitted.

3.8.2 Contraction Joints in Slabs on Grade

There are no contraction joints for the tank slab.

3.8.3 Expansion Joints

Installation of expansion joints and sealing of these joints shall conform to the requirements of Section 03150 EXPANSION JOINTS.

3.8.4 Dowels and Tie Bars

Dowels and tie bars shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200 CONCRETE REINFORCEMENT and herein. Conventional smooth "paving" dowels shall be installed in slabs using approved methods to hold the dowel in place during concreting within a maximum alignment tolerance of 1/8 inch in 12 inches. "Structural" type deformed bar dowels, or tie bars, shall be installed to meet the specified tolerances. Care shall be taken during placing adjacent to and around dowels and tie bars to ensure there is no displacement of the dowel or tie bar and that the concrete completely embeds the dowel or tie bar and is thoroughly consolidated.

3.9 FINISHING FORMED SURFACES

Finishing of formed surfaces shall be as specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable

and free from cracks or loose or drummy areas at the completion of the contract and, for Class A and B Finishes, shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

3.9.1 Class B Finish

Class B finish is required to all formed concrete surfaces. Fins, ravelings, and loose material shall be removed, all surface defects over 1/2 inch in diameter or more than 1/2 inch deep, shall be repaired and, except as otherwise indicated. Defects more than 1/2 inch in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep.

The Contractor shall prepare a sample panel for approval (as specified in PART 1) before commencing repair, showing that the surface texture and color match will be attained.

3.9.2 Smooth Finish

After other concrete construction is complete in each overall separate contiguous area of the structure, smooth finish shall be applied to the areas indicated on the drawings. A mortar mix consisting of one part portland cement and two parts well-graded sand passing a No. 30 sieve, with water added to give the consistency of thick paint, shall be used. Where the finished surface will not receive other applied surface, white cement shall be used to replace part of the job cement to produce an approved color, which shall be uniform throughout the surfaces of the structure. After the surface has been thoroughly wetted and allowed to approach surface dryness, the mortar shall be vigorously applied to the area by clean burlap pads or by cork or wood-floating, to completely fill all surface voids. Excess grout shall be scraped off with a trowel. As soon as it can be accomplished without pulling the mortar from the voids, the area shall be rubbed with burlap pads having on their surface the same sand-cement mix specified above but without any mixing water, until all of the visible grout film is removed. The burlap pads used for this operation shall be stretched tightly around a board to prevent dishing the mortar in the voids. The finish of any area shall be completed in the same day, and the limits of a finished area shall be made at natural breaks in the surface. The surface shall be continuously moist cured for 48 hours commencing immediately after finishing operations in each area. The temperature of the air adjacent to the surface shall be not less than 50 degrees F for 24 hours prior to, and 48 hours after, the application. In hot, dry weather the smooth finish shall be applied in shaded areas or at night, and shall never be applied when there is significant hot, dry wind.

3.10 REPAIRS

3.10.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 4 inches shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part portland cement to 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use.

Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

3.10.2 Repair of Major Defects

Major defects will be considered to be those more than 1/2 inch deep or, for Class A and B finishes, more than 1/2 inch in diameter and, for Class C and D finishes, more than 2 inches in diameter. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

3.10.2.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 2 inches on all sides. All such defective areas greater than 12 square inches shall be outlined by saw cuts at least 1 inch deep. Defective areas less than 12 square inches shall be outlined by a 1 inch deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Contracting Officer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

3.10.2.2 Repair of Deep and Large Defects

Deep and large defects will be those that are more than 6 inches deep and also have an average diameter at the surface more than 18 inches or that

are otherwise so identified by the Project Office. Such defects shall be repaired as specified herein or directed, except that defects which affect the strength of the structure shall not be repaired and that portion of the structure shall be completely removed and replaced. Deep and large defects shall be repaired by procedures approved in advance including forming and placing special concrete using applied pressure during hardening. Preparation of the repair area shall be as specified for surface application of mortar. In addition, the top edge (surface) of the repair area shall be sloped at approximately 20 degrees from the horizontal, upward toward the side from which concrete will be placed. The special concrete shall be a concrete mixture with low water content and low slump, and shall be allowed to age 30 to 60 minutes before use. Concrete containing a specified expanding admixture may be used in lieu of the above mixture; the paste portion of such concrete mixture shall be designed to have an expansion between 2.0 and 4.0 percent when tested in accordance with ASTM C 940. A full width "chimney" shall be provided at the top of the form on the placing side to ensure filling to the top of the opening. A pressure cap shall be used on the concrete in the chimney with simultaneous tightening and revibrating the form during hardening to ensure a tight fit for the repair. The form shall be removed after 24 hours and immediately the chimney shall be carefully chipped away to avoid breaking concrete out of the repair; the surface of the repair concrete shall be dressed as required.

3.11 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

3.11.1 General

In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage, as directed. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

3.11.2 Rough Slab Finish

As a first finishing operation for unformed surfaces and as final finish for slabs to receive mortar setting beds, the surface shall receive a rough

slab finish prepared as follows. The concrete shall be uniformly placed across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails.

Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

3.11.3 Floated Finish

Slabs to receive more than a rough slab finish shall next be given a wood float finish. The screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. Then, after the concrete has stiffened so that it will withstand a man's weight without imprint of more than 1/4 inch and the water sheen has disappeared, it shall be floated to a true and even plane free of ridges. Floating shall be performed by use of suitable hand floats or power driven equipment. Sufficient pressure shall be used on the floats to bring a film of moisture to the surface. Hand floats shall be made of wood, magnesium, or aluminum. Lightweight concrete or concrete that exhibits stickiness shall be floated with a magnesium float. Care shall be taken to prevent over-finishing or incorporating water into the surface.

3.11.4 Troweled Finish

All tank floor slabs shall be given a trowel finish. After floating is complete and after the surface moisture has disappeared, unformed surfaces shall be steel-troweled to a smooth, even, dense finish, free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. Additional trowelings shall be performed, either by hand or machine until the surface has been troweled 4 times, with waiting period between each. Care shall be taken to prevent blistering and if such occurs, troweling shall immediately be stopped and operations and surfaces corrected. A final hard steel troweling shall be done by hand, with the trowel tipped, and using hard pressure, when the surface is at a point that the trowel will produce a ringing sound. The finished surface shall be thoroughly consolidated and shall be essentially free of trowel marks and be uniform in texture and appearance. The concrete mixture used for troweled finished areas shall be adjusted, if necessary, in order to provide sufficient fines (cementitious material and fine sand) to finish properly.

3.12 CURING AND PROTECTION

3.12.1 General

Concrete shall be cured by total immersion of water 60 days after concrete finishing.

3.12.2 Immersion Curing

Concrete slab for sump pit area slab shall be used with impetuous sheeting and continuous mist spraying. The main concrete slab shall be cured by continuous immersed with 1 inches to 2 inches of potable water immediately after finishing the concrete slab for a period of 60 days.

3.13 SETTING BASE PLATES AND BEARING PLATES

3.13.1 Nonshrink Grout

Nonshrink grout shall be a ready-mixed material requiring only the addition of water. Water content shall be the minimum that will provide a flowable mixture and completely fill the space to be grouted without segregation, bleeding, or reduction of strength.

3.13.1.1 Mixing and Placing of Nonshrink Grout

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified therein. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or machinery-bearing surface and the plate shall be filled solid with the grout. Forms shall be of wood or other equally suitable material for completely retaining the grout on all sides and on top and shall be removed after the grout has set. The placed grout shall be carefully worked by rodding or other means to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 65 to 85 degrees F until after setting.

3.13.1.2 Treatment of Exposed Surfaces

For metal-oxidizing nonshrink grout, exposed surfaces shall be cut back 1 inch and immediately covered with a parge coat of mortar consisting of 1 part portland cement and 2-1/2 parts fine aggregate by weight, with sufficient water to make a plastic mixture. The parge coat shall have a smooth finish. For other mortars or grouts, exposed surfaces shall have a smooth-dense finish and be left untreated. Curing shall comply with paragraph CURING AND PROTECTION.

3.14 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM C 1077. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations for conformance with ASTM C 1077.

3.14.1 Grading and Corrective Action

3.14.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for

each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.14.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control.

However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.14.2 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

3.14.3 Scales, Batching and Recording

The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.14.4 Batch-Plant Control

The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during each day's plant operation.

3.14.5 Concrete Mixture

- a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 878. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph Air Entrainment. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the air content at the mixer controlled as directed.
- b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good

reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted.

- c. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 1/2 inch below the maximum allowable slump specified in paragraph Slump in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer. However, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the slump at the mixer controlled as directed.
- d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.
- e. Temperature. The temperature of the concrete shall be measured

when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.

- f. **Strength Specimens.** At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 500 cubic yards or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph Strength Requirements in PART 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. Test specimens shall be molded and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39 for test cylinders and ASTM C 78 for test beams. Results of all strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph Strength Requirements in PART 1) moving average of last 3 "tests" for strength, and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

3.14.6 Inspection Before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.14.7 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Contracting Officer, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.14.8 Vibrators

The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end

of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph Consolidation, shall be immediately removed from service and repaired or replaced.

3.14.9 Curing Inspection

- a. Moist Curing Inspections. At least once each shift, and not less than twice per day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by 1 day.
- c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered, shall compute the rate of coverage in square feet per gallon, and shall note whether or not coverage is uniform.
- d. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.
- f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

3.14.10 Mixer Uniformity

- a. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94.
- b. Truck Mixers. Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and

condition of the blades may be regarded as satisfactory.

- c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.14.11 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

-- End of Section --